

DOCUMENT RESUME

ED 261 991

SP 026 521

AUTHOR Nirschl, Robert P.
TITLE Arm Care. Relief and Prevention for Shoulder Tendonitis, Tennis Elbow, Bursitis and Wrist Sprain in Athletics and Other Activities.
REPORT NO ISBN-0-912261-00-5
PUB DATE Jul 84
NOTE 102p.
AVAILABLE FROM Medical Sports, Inc., Publications Division, P.O. Box 7187, Arlington, VA 22207 (\$7.95).
PUB TYPE Guides - Non-Classroom Use (055)
EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS *Athletics; Exercise Physiology; *Injuries; *Physical Therapy
IDENTIFIERS *Arms (Anatomy); *Shoulders (Anatomy)

ABSTRACT

The book provides a practical and meaningful treatment program for athletes involved in sports which injure the arm or shoulder to a high degree, such as tennis, baseball, swimming, raquetball, pole vaulting, javelin throwing, and weight training. The book's chapters present information on: (1) symptoms of injury; (2) the anatomy of injury; (3) athletic technique factors; (4) pain; (5) treatment of injury; (6) rehabilitative exercise; (7) warm up exercise; (8) flexibility exercise; (9) rehabilitative strength exercise; (10) return to sports after injury; (11) control of force loads; and (12) surgery. An addendum chapter outlines warm-up cool-down routines and practice schedules following injury. (CB)

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ARM CARE

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Relief and Prevention For Shoulder Tendonitis, Tennis Elbow, Bursitis and Wrist Sprain In Athletics and Other Activities

Robert P. Nirschl, M.S., M.D.

SP 026 521

Arm Care
by
Robert P. Nirschl, M.S., M.D.

Clinical Assistant Professor, Division of Orthopedic Surgery,
Department of Surgery, Georgetown University School of Medicine;
Attending Orthopedic Surgeon, Arlington Hospital; Medical
Director, Virginia Sportsmedicine Institute; Chairman, Committee
on Sportsmedicine, Medical Society of Virginia; Member
Sportsmedicine Committee, United States Tennis Association;
Orthopedic Consultant, President's Council on Physical Fitness
and Sports; Contributing Editor, World Tennis Magazine,
1978-1982; Contributor, Advantage Magazine, United States
Professional Tennis Association.

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Library of Congress Catalog Card No. 81-80719

ISBN 0-912261-00-5

First printing, December 1982

Second printing, July 1984

Published in the United States of America by:



MEDICAL SPORTS, INC.
Publications Division
P.O. Box 7187
Arlington, Virginia 22207

Preface

The practical precepts of this book have been developed at the Virginia Sportsmedicine Institute while treating literally thousands of patients with the miseries of shoulder tendonitis (bursitis), tennis elbow tendonitis, and wrist sprain. Janet Sobel, B.S., P.T., Director of Rehabilitation has been invaluable in her contributions to our ever evolving treatment and rehabilitation concepts and programs. I am as well grateful to Agatha Fleeson, B.S., R.N., Director of Research, Medical Sports, Inc. for her pertinent suggestions and dedicated effort.

ACKNOWLEDGEMENTS

Brace Division, Medical Sports, Inc.
For

Illustrations
Counter Force Braces
Uni-Weight
ISO'-FLEX
Ice Strap
Hand Sizer

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ARM CARE

Chapter I Introduction

The basic treatment program for any sports injury induced by abusive overload includes the following:

1. Relieve pain and inflammation.
2. Promote healing.
3. Rehabilitative exercise.
4. Control of abusive overload.
5. Surgery when needed.

Of these concepts, appropriate exercise and control of abusive overload are also highly appropriate for the prevention of injury.

Unfortunately, many recreational athletes cause injury by "taking up a sport to get in shape" rather than "getting in shape to take up a sport." Competitive athletes also make a serious mistake when they believe that the exercise specificity of "playing their sport" is all that is required to maintain conditioning for a highly competitive level. Both of these concepts are laden with injury producing danger.

It is my purpose in this book to provide a practical and meaningful program to those recreational and competitive athletes who are involved in sports which injure the arm and shoulder to a high degree. At present, the largest percentage of problems are related to tennis, baseball and swimming, but other sports such as racquet ball, pole vaulting, javelin throwing and weight training also contribute in ever increasing numbers.

The reader should appreciate at the outset that this book has narrowed its focus to the arm and shoulder. One should not interpret this to mean, however, that a full and total body conditioning program

including aerobics, anaerobics, strength, endurance and flexibility is unnecessary. We highly recommend that for good health, as well as maximum sport achievement and enjoyment, a full conditioning program be utilized as a key addition to concepts provided in this book.*

* Nirschl, Robert P., M.D.

The Book Of Physical Conditioning.

Chapter II

Symptoms of Injury

SHOULDER TENDINITIS:

The pain and tenderness of shoulder tendinitis in most instances start gradually. Onset may occur in the teens with competitive athletes, but more often occurs in the third and fourth decades. The most common area of shoulder tendinitis is anterior but a combined posterior and anterior tendinitis is also fairly common.

Location Posterior Tendinitis



Posterior (back side) upper shoulder pain often reflects neck problems or neck nerve pinch.



Posterior shoulder tendinitis often combines with anterior tendinitis.

Location Anterior Tendinitis



Anterior shoulder tendinitis may migrate some. Is most noted when arm raises to side horizontally.

TENNIS ELBOW:

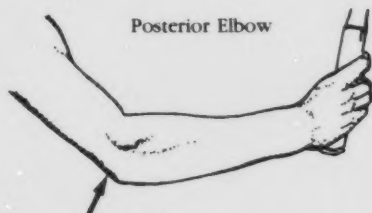
The pain and tenderness symptoms of tennis elbow in most instances start gradually. The most common onset of tennis elbow symptoms is between 35 and 50 years of age, male or female, in a person who uses the forearm heavily (such as tennis play 3-4 times per week).

Location of the symptoms for the varieties of tennis elbow are usually located as indicated in the illustrations:



Lateral Elbow

Lateral elbow pain often migrates down the forearm.



Posterior Elbow

Symptoms are noted when elbow is straightened sharply.

Medial Elbow



Medial tennis elbow pain is often just below at the elbow point.

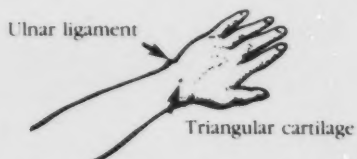


Most common ulnar nerve pinch (funny bone) occurs at Zone 3 canal of medial elbow.

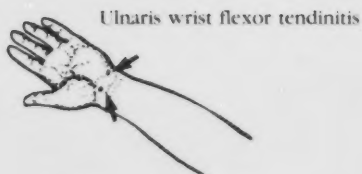
WRIST SPRAIN:

Wrist sprain and tendinitis symptoms in the participants of the racquet and throwing sports most often occurs in the late teens to the mid- thirties.

The common areas are as noted in the illustrations. Symptoms are often associated with improper sport technique or equipment size.



Distal Radial-Ulnar Sprain and
Triangular Cartilage Injury



Radialis wrist flexor tendinitis

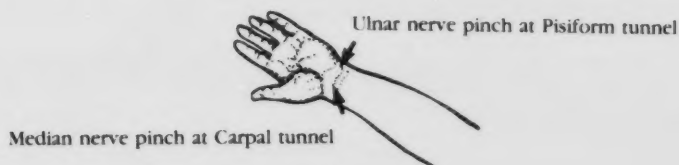


Ulnar Ligament Palm Side

NERVE PINCH SYMPTOMS:

Numbness and tingling sensations may occur in conjunction with tendinitis. These symptoms are caused by nerve pinch. Long and ring finger symptoms indicate a median nerve problem (usually at the wrist carpal tunnel). It is also possible to have nerve pinch occur in other areas, most commonly the neck. Small finger symptoms indicate ulnar nerve pinch usually at the medial elbow. But other possibilities include the wrist pisiform tunnel, shoulder thoracic outlet and neck.

If nerve pinch symptoms occur (they may occur suddenly), check with your doctor. In the majority of cases, these symptoms can be permanently relieved.



Chapter III

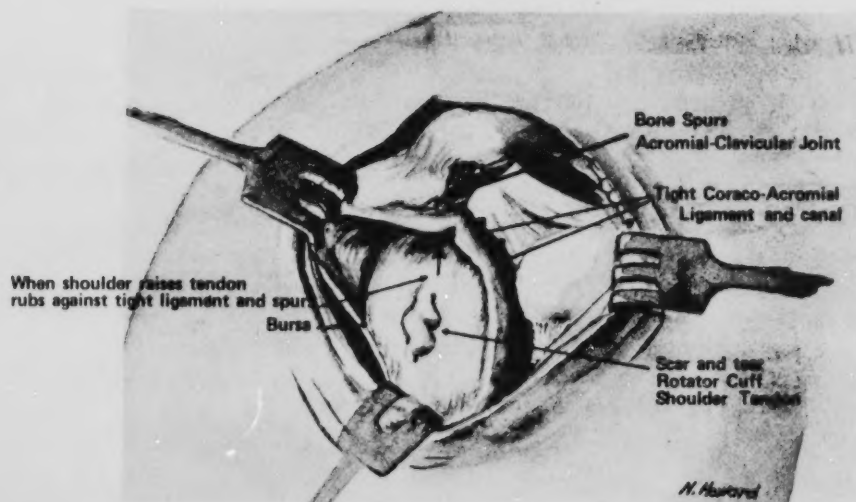
The Anatomy of Injury

SHOULDER ANATOMY:

The shoulder is a very complex joint. It is balanced on the one hand between strength and stability (with powerful supporting muscles), and on the other hand by marked flexibility (because of shallow joint design). This wonderful capability, however, makes the shoulder a prime candidate for tendonitis. As the shoulder is raised, the rotator cuff tendon repeatedly rubs on the upper shoulder structures (Acromion, ligaments and Acromio-Clavicular (A-C) joint), causing a constant irritation. This irritation can result in chronic inflammation, poor tissue nutrition and invasion of poor quality painful fibro-scar reparative tissue (tendonitis-bursitis). Constant rubbing and poor nutrition can result in poor healing. Tendon rupture can even occur if the process persists too long. Before the recent resurgence of sports activities, most shoulder tendinitis occurred in people over forty. Now, shoulder tendinitis is common in teenagers, secondary to such competitive sports activities as swimming, baseball, tennis and weight lifting.

Although anterior rotator cuff tendinitis is the most common problem, posterior cuff tendinitis, strain to shoulder blade muscles and Acromio-Clavicular (A-C) osteoarthritis are all quite common. In general, all of the above maladies will respond to a similar treatment program---with minor adjustments in the exercise specifics. NOTE: Pain initiating in the neck and migrating down the back of the shoulder is often neck osteoarthritis with nerve pinch and is not a true shoulder problem. Combinations of neck and shoulder pain are, however, fairly common. When this occurs, diagnostic testing of both the neck and shoulder is indicated.

Shoulder Tendinitis



When the shoulder is raised, the sensitive tendon cuff rubs in the tight Coraco-Acromial canal, causing pain and injury.

TENNIS ELBOW ANATOMY:

Tennis elbow is divided into three areas: lateral, medial and posterior. Lateral is the most common, medial less common (the ratio of lateral to medial is five to one) and posterior is relatively uncommon.

The usual tennis elbow is a painful alteration of tendons (tendinitis). Lateral tennis elbow is extensor tendinitis (primarily extensor Carpi Radialis Brevis). Medial tennis elbow is flexor tendinitis (primarily flexor Carpi Radialis and Pronator Teres). Posterior tennis elbow is Triceps tendinitis.

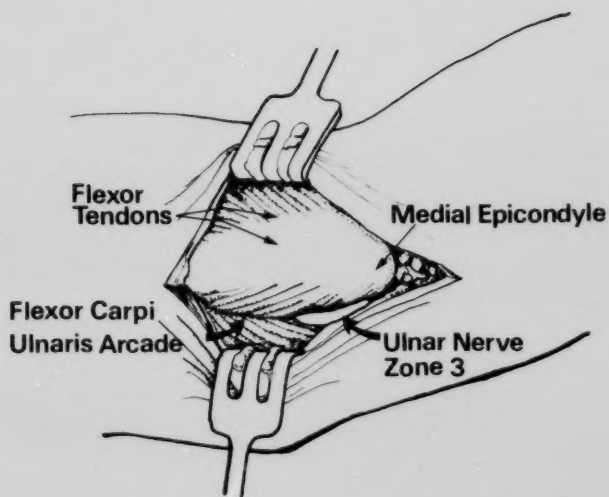
The human elbow, because of its design, is predisposed to a concentration of forces at the elbow epicondyles. Repetitive overloads in these areas probably compresses out the blood supply and nutrients as well as causing small tears. The reparative tissue (special type of invasive fibro-scar) is of poor quality, slow to heal and, unfortunately, painful.

Lateral Elbow



Anatomical Drawing of Lateral Tennis Elbow

Fibro-angiomatous Tendinitis scar (fibro-scar) usually found in the wrist Extensor Brevis tendon.



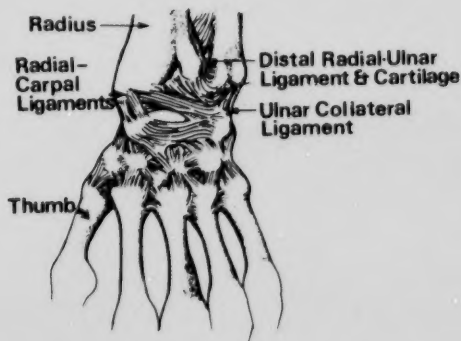
Anatomical drawing of Medial Tennis Elbow

Fibro-antomatous Tendinitis scar usually occurs in the Flexor and Pronator tendons; nerve pinch often occurs in Zone 3 of the elbow funny bone groove.

WRIST PROBLEM ANATOMY:

Excluding a fall or sudden traumatic injury, the most common problem seen in the racquet and throwing sports are sprains of the wrist ligaments on the ulnar (small finger side) and back side of the wrist.

Excess wrist roll in any activity commonly causes overload to the triangular cartilage at the mid-back of the wrist, (at the joint between the forearm radius and ulna bone). A third common complaint is flexor tendon overload at the ulnar wrist flexor. Nerve pinch of the ulnar nerve at the pisiform wrist tunnel or median nerve at the carpal tunnel is also quite common. Nerve pinch symptoms (numbness and tingling of fingers) are often mistakenly thought to be "poor circulation." These symptoms may be initiated by the use of a racquet, shovel handle, etc., causing a pinch of either nerve at the wrist canals. Ulnar nerve pinch causes small finger numbness and hand weakness. Median nerve pinch causes long and ring finger numbness plus weakness of thumb pinch.

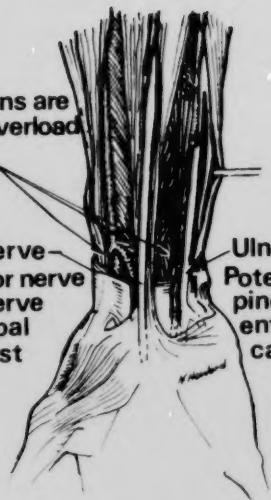


Wrist—Dorsal View

Wrist tendons are
subject to overload
tendonitis

Median Nerve—
Potential for nerve
pinch as nerve
enters carpal
tunnel wrist
canal

Ulnar Nerve—
Potential for nerve
pinch as nerve
enters pisiform
canal



Wrist—Palmar View

Chapter IV

Athletic Technique Factors

Every activity has a technique that may be biomechanically sound or poor. In movements such as lifting or shaking hands, for example, occurrence of pain quickly informs the sufferer that there must be a better way. He will generally be able to change to a more comfortable technique, thereby accomodating to many daily activities.

Regular or systematic arm use is necessary, not only as a preventive measure against damage, but also as an important aid to recovery from injury. In sports activities, a change of technique may often relieve symptoms and improve athletic performance simultaneously.

CAUSES OF INJURY:

A variety of factors are often implicated in any injury. Some we can alter and it is wise to do so before injury occurs.

Contributing factors to injury include:

1. Abusive overload.
 - a. Poor Sports technique.
 - b. Excess intensity or duration of sport activity.
2. Improper conditioning for specific sport activity.
3. Poor hereditarial body design for specific activity.
4. Associated body deficiencies (from injury or otherwise).
5. Age.

We are of course incapable of altering our age and heredity but there is much we can do in the other categories. Of this group "poor sports technique" is perhaps least understood and most difficult to alter.

Shoulder

Pinching of the rotator cuff tendon occurs primarily when the arm is lifted away from the body to the horizontal position (ninety degrees of abduction). It is at this position that the shoulder canal (Coraco-Acromial Arch) is the tightest. The shoulder position well above or below the horizontal allows the most relaxation in the arch (by raising or lowering the shoulder blade). Those positions well above or below the horizontal protect the rotator cuff from irritative rubbing (e.g., tendinitis).

MECHANISMS OF OVERLOAD, SHOULDER AND MEDIAL ELBOW



The ninety degree angle position is most derogatory, as the shoulder canal is tightest. In addition, forces on the medial elbow are high. This position therefore increases the chances of injury to both the shoulder and medial elbow.



High arm elevations are more protective to the shoulder tendon cuff (by shoulder blade elevation which releases the tight Coraco-Acromial canal). Higher elevations also diminish medial elbow force load.

More irritation occurs when the arm is further from the side of the body (abduction). The shoulder arch is more relaxed when the shoulder is elevated close to the body, such as in the jump shot in basketball.

It is for these reasons that sports such as baseball pitching, swimming, and tennis initiate shoulder tendinitis, and a sport such as basketball usually does not.

Tennis Techniques

SHOULDER:

Tennis offers an excellent opportunity to observe the importance of varying technique.

TENNIS SERVE



FAULTY SERVE PREPARATION

Arm abduction away from the body and approximately at ninety degrees.



FAULTY SERVE BACK SCRATCH

"Tray" position of racquet
Twisting of Arm at horizontal (90 degree abduction) irritates rotator cuff.



FAULTY SERVE IMPACT

Poor elevation.
Relatively horizontal arm position with arm twisting (internal rotation) for power at ball impact.



QUALITY SERVE PREPARATION

Elevation above ninety degrees



QUALITY SERVE
BACK SCRATCH

Shoulder elevated and relaxed. Elbow bend results in proper back scratch protecting shoulder & elbow.



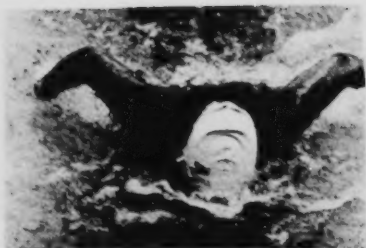
QUALITY SERVE IMPACT

Good elevation. Arm close to body and fully up protects rotator cuff.

The illustrations depict the important points. If your sport or activity is not directly discussed or illustrated here, you can easily transfer this information to other activities since it is the arm position and quantity of repetitions that cause the problem.

Swimming Techniques

The angles of shoulder position and rotation are critical in all sport activity to prevent or rehabilitate from injury. In swimming the shoulder is vulnerable in both the pull-thru and recovery phases.



BUTTERFLY SWIM STROKE

The Butterfly places substantial stress on the shoulder. Water turbulence tends to be high.



WATER TURBULENCE

Swimming techniques which generate high surface water turbulence invite shoulder overload. The pull thru arm should avoid throwing water against the body as well. Head position when breathing can affect turbulence, shoulder rotation and shoulder elevation.

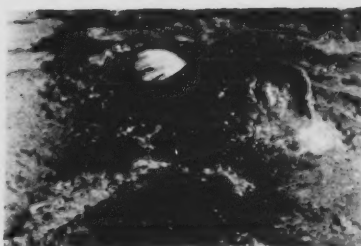


FREE STYLE STROKE

This photo nicely demonstrates both the recovery (right arm) and pull thru phase (left arm) of the free style swim stroke. Dependent upon elevation and rotations, the shoulder may be vulnerable in either phase. High elevations in the recovery phase are most protective.

RECOVERY PHASE (FREE STYLE STROKE)

Rotational angles of the arm are important avoiding injury. Note how the hand is vertical in this photo. Vertical position allows the hand to slice thru the water eliminating water drag. To accomplish this, the shoulder is internally rotated.



Elbow

Like the shoulder, the elbow is subject to similar overload abuses by technique inadequacies. The major error is using the smaller, less powerful forearm muscles for a job best done by the more powerful shoulder muscles. This error has a high injury potential and results in poor sports performance.

LATERAL TENNIS ELBOW:

Tennis Techniques

In lateral tennis elbow, the overload occurs at the forearm extensors (muscles on the back of the forearm which raise the wrist). One special muscle (the extensor brevis) seems to be affected most often because of its position and function. In tennis, this overload most commonly occurs during an incorrect backhand, but the serve and forehand cause problems as well. The key point in the tennis backhand is to keep the elbow firm and almost fully extended (a small amount of elbow bend aids in shock absorption) during the stroke. Motion and power therefore come from body weight transfer and shoulder motion. The forearm muscles are used primarily for racquet control in a quality stroke.

TENNIS BACKHAND



FAULTY BACKHAND PREPARATION

Elbow out, shoulder up.



QUALITY BACKHAND PREPARATION

Elbow and front shoulder down
Elbow flat and in.



FAULTY BACKHAND IMPACT

Front shoulder remains up, body leans backward, racquet down, racquet motion occurs by elbow straightening. The potential of forearm muscle overload in this stroke pattern is great.



QUALITY BACKHAND IMPACT

Power from shoulder motion and forward weight transfer. Front shoulder down, elbow firm. The forearm muscles are better protected with this stroke. The two handed backhand is even more protective.

MEDIAL TENNIS ELBOW:

Throwing Techniques

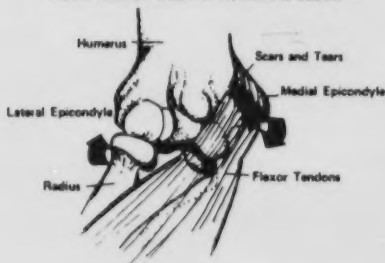
Medial tennis elbow overload occurs at the elbow origin of the forearm flexors, especially the pronator and the thumb-side wrist flexors. Techniques which constantly require wrist snap and forearm pronation (a late forehand stroke in tennis, baseball throwing or the pull-through in swimming) are prime causes. Techniques which stretch the medial elbow (baseball pitching, a quality tennis serve, or javelin throwing) are also major causes of medial overload.

Side view of throwing motion demonstrates stretch pressures on the Medial elbow.



Valgus overload as depicted in illustrations of sports technique result in tension injury to medial elbow structures and compression of the lateral elbow. In addition to tendon and ligament injury, bone may chip off and calcium spurs can form.

MECHANISM OF OVERLOAD, MEDIAL ELBOW



Adult and little league pitching motions are similar. Medial elbow overload in children will result in growth line disturbance (little leaguer's elbow), rather than tendinitis. Refer to illustrations on page (24) for protective motion.

Some techniques as noted above, are poor for both sports efficiency and arm biomechanics. Correction, therefore, results in improved sports ability as well as arm health. Other movements, however, although effective as sports techniques, can cause arm injury. These motions are harder to correct while maintaining the desired level of sports effectiveness. For the highly competitive athlete, this situation often requires quality coaching help, including slow motion video, biomechanical and possibly computer analysis.

Little League Elbow

Much has been said about little league elbow. This malady may be defined as an overuse irritation of the medial elbow growth line. The mechanism of injury is the same as with adult throwing, namely a stretching (valgus stress) of the medial elbow structures with throwing. In youngsters, the "open" growth line is more vulnerable than the tendon and ligament attachments.

The symptoms are similar to adult medial tennis elbow. X-rays usually show nothing, but can show minor to major changes of the medial growth line and on occasion lateral elbow compartment compression changes as well.

Some studies in the past have suggested an incidence as high as seventy percent of all little league pitchers. Recent studies including our own study indicate a very low incidence. Note: Our study revealed only four percent.

Curve ball throwing has been anecdotally implicated as a technique cause of little league elbow. The curve is imparted by variations in forearm rotation. In our studies, forearm variation plays little role in medial elbow overload.

The major causes of little leaguer's elbow are similar to adult medial tennis elbow:

1. Excessive throwing.
2. Horizontal arm elevation in the throwing technique.
3. Sharp wrist snap and forearm pronation (e.g., fast ball technique).

The treatment for little league elbow is similar to tennis elbow. In most instances, good results will occur with less throwing and better elevation in the throwing technique.

Medial Elbow Overload
TENNIS FOREHAND



FAULTY FOREHAND PREPARATION

Exaggerated backswing.
Pulls body backward.



QUALITY FOREHAND PREPARATION

Proper balance, ready to
move.



FAULTY FOREHAND IMPACT

Impact late (off right hip).
Wrist snap is necessary to bring
the racquet forward. Body weight
is backward. Medial elbow forearm
muscles are easily overloaded
with this stroke.



QUALITY FOREHAND IMPACT

Forward weight transfer, wrist
firm in position of anatomic
strength, ball impact point at
forward foot. Forearm is in
neutral. The elbow tendons are
protected with this stroke.

Posterior Tennis Elbow

Posterior tennis elbow (triceps tendinitis) occurs with heavy and sudden elbow extension (usually a snapping motion such as the tennis serve or baseball pitching). The basic technique may be correct, but a smoother and less snapping end point in the motion is needed.

Wrist

Ulnar wrist sprain usually begins with adherence to over-zealous coaching advice. In tennis, the instruction to "lay your wrist back" on the forehand ground stroke and volley is especially troublesome. A rigid hyperextended wrist is a poor shock absorber.

Exaggerated wrist roll in any activity commonly disrupts the distal radial-ulnar joint, causing injury to the ligaments and the triangular cartilage. In tennis this is often purposely done in the mistaken belief that topspin is achieved by wrist roll. In fact, topspin is not attained by wrist roll, but by forward elevation.

Excess wrist snap may cause overload tendinitis at the ulnar wrist flexor. This technique also causes medial elbow problems (see faulty forehand).

An unduely large handle (racquet, hammer, shovel, etc.) may cause ulnar nerve or median nerve pinch at the two wrist canals, especially if excess wrist flexion is used in the technique.

WRIST GRIP POSITIONS



WRIST LAY BACK

Exaggerated position is poor shock absorber and invites injury to wrist ligaments.



PROPER IMPACT POSITION

Position of anatomic strength is most powerful and more protective.

Wrist Overload
TENNIS STROKES



FAULTY FOREHAND STROKES

Late stroke is hit with wrist snap inviting injury.



WRIST ROLL - FOREARM ROLLOVER

This stroke often overloads and sprains wrist ligaments, and the wrist triangular cartilage. Overload to both the medial and lateral elbow may also occur.



QUALITY FOREHAND STROKE

Wrist in position of anatomic strength. Impact point is off forward foot, with full forward weight transfer. Forearm is in neutral.



QUALITY FOREHAND FOLLOW-THRU

Forearm does not roll over but remains in neutral position protecting the wrist and medial elbow.

Chapter V

Importance of Pain

Pain is an indicator that something is causing irritation of the nerve pain fibers. It is not always, however, an indication that serious harm is occurring. To help you differentiate harmful from non-harmful problems, the following guidelines are suggested:

BENEVOLENT PAIN:

- Phase 1. Stiffness or mild soreness after activity. Pain is usually gone within 24 hours.
- Phase 2. Stiffness or mild soreness before activity which is relieved by warm-up. The symptoms are usually gone during activity but return after activity (for 48 hours or less).

SEMI-BENEVOLENT PAIN:

- Phase 3. Stiffness or mild soreness before activity. Pain is partially relieved by warm-up but minimally present during activity. This pain is usually controlled by precautionary activity modification and Counter Force bracing (see section on Bracing). Mild anti-inflammatory medication may be indicated with Phase 3 pain. Without precautions, Phase 3 pain may progress to Phase 4.

HARMFUL PAIN:

- Phase 4. Significant (moderate or greater) pain before, during and after activity. Activity (even with modification) causes aggravation. Complete rest usually controls pain.
- Phase 5. Phase 4 pain which persists even with complete rest. Commonly disrupts sleep.

CAUTION: No guideline can be accurate for every individual case. If there is any question, check with your doctor. In general, however, pain Phases 1 and 2 are self-limiting with proper precaution. Phase 4 and 5 pain generally require medical attention. If Phase 3 pain persists, beyond one week, medical attention is recommended.

Chapter VI

Treatment of Injury

The Basic Concepts of Treatment

1. Relief of pain and inflammation.
2. Promote healing.
3. Rehabilitation Exercise.
4. Protection from abuse.
5. Surgery if necessary.

The above concepts are true whether the problem is shoulder, elbow or wrist (or other musculo-skeletal body parts for that matter).

CAUTION: Specific treatment programs are highly individualistic. The treatment recommendations that follow are for a typical problem. It is recommended you have the full approval of your doctor before implementation.

Relief of Pain

1. ANTI-INFLAMMATORY MEDICINES.

My first choice is buffered aspirin. As many as eight a day, depending upon circumstances. Non-steroidal medication such as Motrin, Naprosyn and Butazolidin can be helpful as well. Cortisone use (oral or by injection) is quite selective for more painful conditions. Note: Long term cortisone may cause tendon weakness. Restriction to three injections into any specific area is recommended.

CAUTION: All medicines have the potential of serious side effects and should not be taken without your doctors approval.

2. REST.

My definition of rest is absence from abusive painful activity. Total immobilization (such as casting) results in further weakness and muscle atrophy and is not usually recommended.

3. PHYSICAL THERAPY MODALITIES.

A. Ice.

Ice or cold application is always advisable after injury (unless frostbite, allergic sensitivity, or poor circulation exists). Ice should be applied anytime the signs of inflammation are present, no matter how soon or late after injury.

Signs of Inflammation:

- .Swelling.
- .Tenderness to touch.
- .Injured area feels feverish (warm) to touch.
- .Redness at injured area.

Ice can:

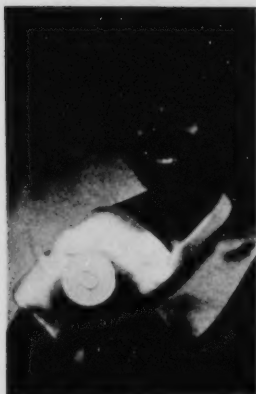
- .Bring pain relief.
- .Bring spasm relief.
- .Reduce swelling
- .Decrease inflammation.

Ice is best applied as follows:

1. Immediately after activity or injury.
2. Use a commercial or plastic ice bag. Note: If ice is not readily available, carry ice cubes to the activity area in a thermos.
3. Hold ice in place or use ice massage.
4. The duration time of ice application may vary, but the usual minimum is 30 minutes.
5. Ice should be used until inflammation is controlled (30 minutes on, 30 minutes off).

NOTE: It often takes days before full inflammation control is achieved.

CAUTION: If excessive skin redness occurs, check with your doctor.



ICE STRAP

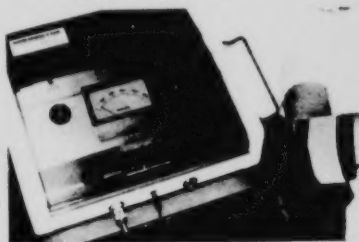
Convenient way to support ice in proper position while continuing daily activities.

B. Heat.

Application of heat also relieves pain and spasm, but has the potential to increase swelling and inflammation. Thus heat is usually not indicated in the early stages after injury unless the signs of inflammation have been eliminated. Heat can be applied in many forms including hot showers, electric pad, massage, infra-red lamp and diathermy. Moist heat by hydrocollator, whirlpool or thermophore pad are often more effective.

C. Physical Therapy.

1. A wide variety of options are now available to the physical therapist. One of the most effective modalities for the treatment of tendinitis and sprain is high voltage Galvanic stimulation. Our usual routine at the Virginia Sportsmedicine Institute is 3 to 6 sessions (but again dosage is highly individualistic).



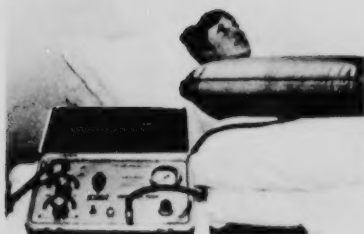
Portable high voltage Galvanic units now make home treatment a convenient approach.

Note: High Voltage Galvanic stimulation should not be confused with the transcutaneous nerve stimulators (TNS) used for pain relief by skin stimulation. The true high voltage units have the capacity to actively contract muscle.

Ultra-sound has also been of some benefit, but overall has been less effective than Galvanic stimulation.

2. For arm swelling (often noted after competitive baseball pitching) the use of a graduated air compression unit has been helpful.

JOBST COMPRESSION PUMP



Intermittent air compression has been a good aid in reducing the edema of athletic injury.

Medical technology is changing rapidly and I look forward to further advances in the treatment concepts of physical therapy.

D. Unorthodox Methods.

Acupuncture and DSMO application are presently in semi-vogue. I have prescribed neither but have treated many patients who have admitted to receiving or self applying such treatment. In my observation neither treatment has proved beneficial other than very short term relief, possibly by placebo effect. There has been no observed evidence of increased strength or elimination of pathological tissue.

Promotion of Healing

When pain Phase 2 or less is achieved (Note: Cortisone injection can confuse this determination) and no local heat (to touch) is noted at the injured area, the following is started:

1. Active motion exercises to injured areas (Note: stretching by others may cause injury and is not usually recommended).
2. Gradual strength training to uninjured adjacent parts (Note: Do not abuse injured area - use of a Counter Force Brace is recommended for additional protection see page (35).
3. Continued use of high voltage electrical stimulation on a selective basis.

Chapter VII

Rehabilitative Exercise General Concepts

When essentially normal motion has been attained and pain Phase 2 or less is noted with average daily activities, rehabilitative exercise to the injured area is usually started.

GENERAL EXERCISE:

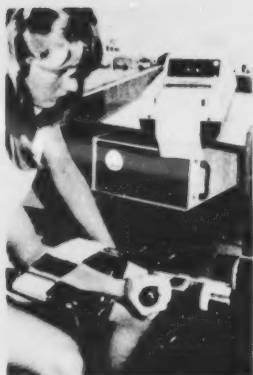
Exercise to uninjured areas can be instituted at any time after injury (the sooner the better) so long as the injured area is not subject to injury with the exercise. In upper extremity injury, maintenance of aerobic conditioning as well as leg and back strength and flexibility should be easily attained by running, biking, strength machines, etc.. Body parts adjacent to the injured area can also often be exercised early (such as neck and shoulder in elbow injury, etc.).

General exercise is highly recommended. It maintains a high positive effect in aiding the rehabilitation of the injured part with associated gentle activity, increased circulation and nutritional perfusion.

REHABILITATIVE TECHNIQUES:

1. Base line strength test:

To assess progress and to understand the magnitude of strength deficits, it is essential to have some form of strength test plus a measurement for atrophy. Circumferential tape measurement is helpful to assess atrophy. Cybex dynamometer is the most sophisticated strength test at present. Other forms of measurement include grip strength dynamometer and maximum weight lift. (Note: weakness often extends throughout the entire extremity, not just the immediately injured area).



CYBEX STRENGTH TEST

Upper body table straps in the forearm for a more accurate test. Accuracy and isolation of muscle groups make Cybex a superior test technique.



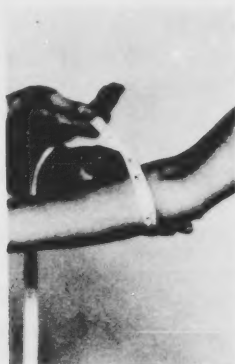
UNIVERSAL TYPE ISOTONIC
WEIGHT TEST

Slowly increase weight resistance until maximum comfortable level is achieved. Note: Weight test must be administered carefully to prevent injury and to isolate specific muscles to be tested.



JAMAR DYNAMOMETER

Grip test is helpful and simple but does not isolate various muscle groups.



TAPE MEASUREMENT

2. COUNTER FORCE BRACING:

As a protection, Counter Force bracing is recommended for the first week of rehabilitation exercises. In years past, the primary concept of bracing was to keep the injured area rigid. Unfortunately rigid supports result in atrophy and the weight and encumbrance of rigid bracing precludes athletic or exercise activity. On the other hand, elastics just do not give enough support. The Counter Force concept was initiated in 1970. Its principle is to give firm non-elastic anatomical support and protection for an expanding muscle or moving tendon, while at the same time allowing freedom of joint movement.

The pulling or expanding of a contracting muscle-tendon unit gently pushes off the non-elastic Counter Force brace decreasing internal muscle tension and lending needed support without pinching blood vessels or nerves. These arm braces (lateral elbow, medial elbow and wrist) have proven successful in pain relief. Counter Force should be utilized only during the time of potentially injurious activity or at rehabilitative exercise start.

NOTE: The duration of Counter Force use for rehabilitation is highly individualistic. One week's use as a precaution has been average. For sport activity, Counter Force braces may be used as a protective precaution.

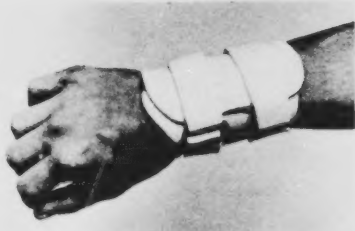


elb'aid Lateral

For lateral and posterior
tennis elbow



elb'-aid medial
For medial tennis elbow



wrist'-aid R-U
For wrist sprain and
tendinitis



wrist'-aid R-C
For full wrist support
minor fractures

Wide non-elastic multiple tension C-Force braces curved to fit anatomically offer ideal Counter Force support.

3. CONTROL INFLAMMATION:

If your doctor approves, take two buffered aspirin 15 minutes before rehabilitative exercise. This helps to relieve stiffness and control the potential for inflammation with exercise.

4. WARMERS:

If additional warmth is comforting (especially during cold weather), an elbow or wrist warmer can easily be constructed by cutting the toe out of an old wool athletic sock and pulling it over the Counter Force brace at the wrist or elbow. Commercial warmers of wool or orlon are quite inexpensive, comfortable and effective.



warm'-aid

COMMERCIAL WARMER WORN OVER LATERAL ELBOW
COUNTER FORCE BRACE

General Exercise Principles

1. This program is to be undertaken only with your physician's approval.
2. Do not start this exercise program until normal motion is basically achieved and pain is Phase 2 or less.
3. These exercises can be useful as a conditioning program to prevent injury, especially for recreational athletes.

4. Do these exercises only after proper warm-up. (See Chapter on Warm-up)
5. Do these exercises daily. Consistency is important for effectiveness in rehabilitative exercise.
6. It is best to set aside a specific time each day for your exercise program.
7. All exercises should be done slowly and smoothly.
8. Begin with 6-8 repetitions and progress gradually. Increase with one to two repetitions at a time. Proceed until the maximum repetitions are reached. In the exercises that use weights, start with the recommended starting weight, if comfortable, and proceed to the maximum recommended repetitions. Once you can do this for 3 consecutive exercise sessions, increase the weight by approximately ten percent and lower repetitions to the 6 to 8 level. Proceed again until the maximum repetitions are achieved. Continue progression until normal strength has returned.

NOTE: The recommended starting weights are only an average. Both arms should be strength tested and the recommended starting weight be adapted accordingly.

9. Exercise caution. General stiffness is common after starting an exercise program. This may be noted several hours after an exercise session but generally abates with gentle activity or warm-up. If soreness persists past four days, check with your doctor. If you experience actual pain during or after exercise you are either doing too much too fast, or the tissue inflammation needs more rest and control. Stop for a few days and try again with fewer repetitions and less weight. Counter Force bracing (see p. 35) and ice application (see p. 29) are usually beneficial in these instances. If Phase three pain persists, check with your doctor.

Chapter VIII

Warm-Up

The body muscles and tendons are intertwined with lard substances. Gelling of these substances (like lard in the refrigerator) results in stiffness and extra tissue friction. A gentle period of increasing body heat (so a light sweat occurs) will prepare your muscles, tendons, ligaments, joints and heart for relaxed, comfortable exercise program. If a specific body part is stiff, actual warming (e.g., heating pad, warm water immersion such as whirlpool, sauna or hot shower) may prove beneficial. Follow this technique with a massage of the stiff or sore area using a methyl salicylate product (e.g., Craemergesic, Ben-Gay, etc.). Finally apply a Counter Force brace and overlying joint warmer.

CAUTION: Stretching or flexibility exercise is not warm-up.

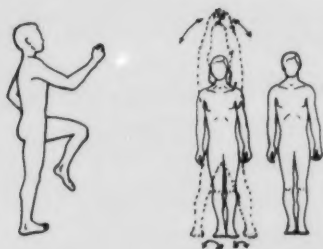
Stretching before warm-up invites injury.

Warm-up Check List:

1. Take two buffered aspirin (with doctor's approval) thirty minutes before activity.
2. Massage sore or stiff areas.
3. Apply Counter Force brace if indicated.
4. Apply warmer if indicated.
5. Do warm-up exercises until light sweat occurs.
6. Proceed to Flexibility Exercises.

WARM-UP EXERCISE

Run in place, jumping jacks, jog or bike until a light sweat occurs.



Chapter IX

Flexibility Exercise Program

Following proper warm-up to a light sweat, flexibility exercise is started. Achievement of full joint motion is the ideal. If injured tissue is painful to flexibility exercise, it is best not to proceed with rehabilitative strength exercise until further pain and inflammation control has occurred. A modification of this concept may be appropriate under certain individualistic circumstances. Check with your medical advisor. This modification can apply if pain occurs only at the extremes of joint motion or in certain arcs of the motion. Rehabilitative exercise may proceed safely if these extremes or arcs are avoided. NOTE: In certain circumstances it is best to avoid full motion and proceed with rehabilitative strength first. ISO'-FLEX exercise (see p.61) is especially helpful in this circumstance.

1. SHOULDER CIRCLES:

A. Exercise Benefit: Chest, shoulders, arms.

B. Starting Position: Stand with feet comfortably apart, head up, trunk straight, buttocks and abdomen firm. Arms extended to side, horizontal to floor.

C. Exercise Action:

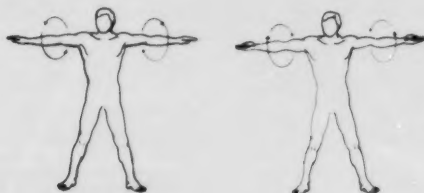
Phase 1. Palms down, rotate arms in forward motion for thirty seconds.

Phase 2. Palms up, repeat Phase 1.

Phase 3. Relax.

Phase 4. Assume starting position with palms down, rotate arms in backward motion for thirty seconds.

Phase 5. Palms up, repeat Phase four.



2. FOREARM STRETCH:

- A. Exercise Benefit: Forearm flexors and extensors.
- B. Starting Position: Sit or stand holding arm comfortably in front of body, elbow completely straight.



C. Exercise Action:

Phase 1. Use opposite hand to slowly stretch the wrist back with the hand in a palm up position. Hold for ten seconds and relax. Repeat three times.



Phase 2. With opposite hand slowly stretch the wrist down with hand in palm down position. Hold for ten seconds and relax. Repeat three times.



Phase 3. Clasp hands, holding palms together. Slowly rotate hands over and back three times. Firmly stretch at rotation end point.

Phase 4. Repeat Phases 1, 2 and 3 with other hand.

3. PENDULUM ARM STRETCH:

- A. Exercise Benefit: Anterior shoulder and arm flexibility.
- B. Starting Position: Stand with feet comfortably apart. Hold weight in right hand. Starting weight: 2-3 pounds. Bend at waist to ninety degrees. Place both hands on left knee. Right hand with weight in front.

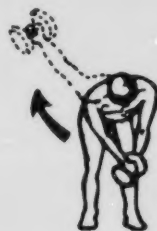
C. Exercise Action:

Phase 1. Swing weight across in front of body to full overhead position, gently stretching shoulder. Then let arm flow back to starting position.

Phase 2. Repeat ten times.

Phase 3. Repeat Phase one and two with opposite arm.

D. Speed: Slow, easy swings.



4. HORIZONTAL SHOULDER STRETCH:

- A. Exercise Benefit: Horizontal shoulder adduction and abduction.
- B. Starting Position: Grasp pole or doorway molding holding arm straight and horizontal.

C. Exercise Action:

Phase 1. Turn body away from grasping hand, stretching arm behind. Hold for four seconds and relax. Repeat four times.

Phase 2. Turn body toward grasping hand stretching arm in front of body. Hold for four seconds and relax. Repeat four times.

Phase 3. Repeat Phase one and two with opposite arm.



5. STANDING TOE TOUCH:

- A. Exercise Benefit: Back flexion, hamstrings.
- B. Starting Position: Stand relaxed, feet close together.

C. Exercise Action:

Phase 1. Keeping knees straight at all times, slowly bend forward attempting to touch floor with finger tips. Smoothly stretch as far as possible. Hold for six seconds.

Phase 2. Repeat four times.



6. TRUNK TWIST:

A. Exercise Benefit: Trunk flexibility.

B. Starting Position: Stand with feet comfortably apart with hands on hips.

C. Exercise Action:

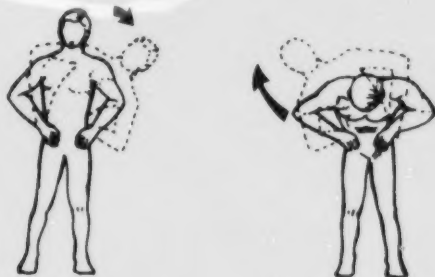
Phase 1. Slowly circle forward and stretch to the left as far as possible. Hold for two seconds. Circle backward to starting position.

Phase 2. Slowly circle forward and stretch to the right as far as possible. Hold for two seconds. Circle backward to starting position.

Phase 3. Repeat Phases one and two in the opposite direction.

Phase 4. Repeat Phases one, two and three, two to three times.

NOTE: If back problems exist, do not circle backward to starting position. Rather return to the starting position from the side position.



Chapter X

Rehabilitative Strength Exercise

Strength rehabilitation can now begin. Do all exercises smoothly and with full range of motion, unless special circumstances have occurred as noted in the Flexibility Section (see p.40).

TECHNIQUE:

1. Strength test both arms. Dynamometer grip testing is easy to do. Cybex testing is much more accurate and revealing as various muscle groups can be isolated in testing. Check with your medical advisor. NOTE: with injury, uninjured adjacent areas are often weak in addition to the injured part.
2. If using isotonic (weight) exercise, weight test both arms to assess maximum weight capability. Each specific exercise must be tested. NOTE: To weight test; start warm-up repetitions with light weights, then lift increasingly heavy weight slowly until you reach a comfortable, controllable maximum weight.
3. If unable to lift weight, start with no weight.
4. Start with a weight three-fourths of your maximum controllable weight. Begin with 6 to 8 repetitions and progress gradually, by one or two repetitions until twelve repetitions for each exercise is reached.
5. When you can handle the weight level past twelve repetitions, (unless otherwise stated) for three consecutive exercise sessions, increase the weight by approximately ten percent or the next weight plate. Lower the number of repetitions to the 6 to 8 level and progress gradually to twelve repetitions.
6. For best results, rehabilitative exercises are to be done daily for a minimum of twelve weeks or until normal strength returns.
7. Do all exercises to proper form and slowly; usually two seconds to raise and three seconds to lower. NOTE: Fast throwing or swinging of the weight decreases the effectiveness of the exercise.

8. Some exercises allow exercise of both arms together (e.g., use a full barbell or two dumbbells). If you wish, one arm at a time may be exercised throughout by using one dumbbell or uni-weight.
9. Record your progress weekly on the enclosed Sportsmedicine progress record.
10. If on a home program, return to your medical advisor for a strength test at six and twelve weeks to have your progress measured and evaluated.

EQUIPMENT:

1. Home Program:
 - a. Dumbbells in one to fifteen pound assortment or uni-weight (see p.61) one to four pounds.
 - b. Barbell with assortment of weights to one hundred pounds.
 - c. ISO'-FLEX Exercise System (may be substituted for weight program).
 - d. Fairly inexpensive home gyms may aid in convenience and efficiency.
2. Strength machines at a medically qualified Sportsmedicine and Rehabilitation Institute.
3. Health Spa or Fitness club if proper equipment and supervision is available. CAUTION: Health or Fitness Spas rarely have exercise instructors qualified to supervise rehabilitative exercise. For knowledgeable advice, a licensed physician or physical therapist is recommended.

BREATHING:

Do not hold your breath while doing exercises. Breathe normally.

CAUTION:

Pain during exercise will decrease your progress or cause harm. Adhere closely to the pain phases recommendations. Always decrease

the weight and repetitions to a non-painful level. If pain persists, stop and try again in two days at a lower weight level. If Phase 3 pain persists beyond four days check with your doctor.

EXERCISE END POINT:

1. When the injured arm has returned to normal flexibility and strength (by strength test) in comparison to the uninjured arm. NOTE: The dominant arm depending upon circumstances is generally ten to twenty-five percent stronger than the non-dominant arm.
2. For strength progression beyond injury rehabilitation, continuation of exercise for both arms is appropriate. Continue exercise until unable to sustain weight progression to twelve repetitions. NOTE: For a full strength program, maximum weight exercise every other day is more productive and is recommended.

MAINTENANCE EXERCISE:

To maintain regained strength, a maintenance program of the same weight resistance three times per week is recommended.

FINAL AIDS AND PRE-CAUTIONS:

1. Do strength exercises only after proper warm-up and flexibility exercises.
2. Take two buffered Aspirin fifteen minutes before exercise when indicated.
3. Use Counter Force Brace for additional protection when indicated (usually first seven exercise sessions at start of rehabilitative exercise.
4. Use warmer when indicated.
5. Ice after exercise when indicated.

Shoulder Section

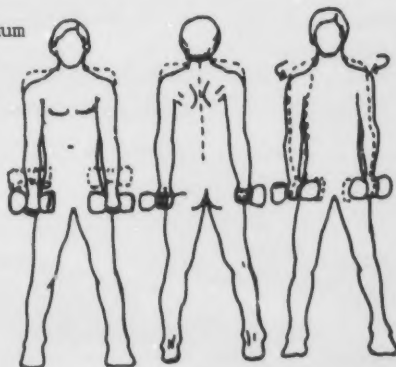
1. SHOULDER SHRUG:

- A. Exercise Benefit: Trapezius, neck, trunk.
- B. Starting Position: Stand with feet comfortably spread, weight held in both hands, knuckles out and arms straight and relaxed at side.
- C. Starting Weight: $3/4$ maximum, usually 5 to 10 pounds in each hand.
- D. Exercise Action:

Phase 1. Slowly shrug shoulders upward and back to maximum position, hold for two seconds, then slowly roll shoulders forward, hold for two seconds.

Phase 2. Slowly return to starting position.

Phase 3. Repeat five times, (fifty times, without weights, scattered throughout the day).



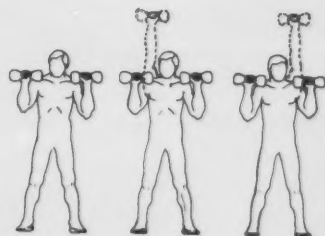
2. RHOMBOID ISOMETRIC:

- A. Exercise Benefit: Rhomboid strength.
- B. Starting Position: Stand with feet comfortably spread, arms at your side.
- C. Exercise Action:
 - Phase 1. Slowly pull shoulders back, pinching shoulders blades together. Hold for five seconds.
 - Phase 2. Release and repeat five times.
 - Phase 3. Repeat fifty times scattered throughout the day.



3. MILITARY PRESS:

- A. Exercise Benefit: Shoulder girdle, upper trunk, triceps.
- B. Starting Position: Stand with feet in balance and comfortably apart. Hold dumbbell in each hand (palms out) at shoulder level.
- C. Starting Weight: $3/4$ maximum weight. Usually 5 to 10 pounds.
- D. Exercise Action:
- Phase 1. Raise right arm fully overhead by straightening the elbow.
- Phase 2. Lower right arm to starting position while simultaneously raising left arm to overhead position.
- Phase 3. Lower right arm and simultaneously raise right arm to overhead position.
- Phase 4. Repeat Phases one, two and three twelve times.
- E. Speed: Raise two seconds, lower two seconds.



4. SHOULDER DIAGONAL SIDE LIFT:

- A. Exercise Benefit: Deltoid, shoulder girdle, upper trunk, humeral rotators, biceps, forearm extensors and supinators.
- B. Starting Position: Stand with feet comfortably apart, right arm straight in front and across body, dumbbell resting on opposite left hip, knuckles pointing out (for right arm exercise).
- C. Starting Weight: $3/4$ maximum. Usually 3 to 5 pounds.



D. Exercise Action:

Phase 1. Keep elbow straight at all times, slowly raise right arm diagonally across to a horizontal position on the right side. Then stretch shoulder backward as far as possible.

Phase 2. Hold Phase 1 position while slowly rolling right forearm to supination (palm up) position, then to full pronation (palm down) position.

Phase 3. Slowly return to starting position. Repeat twelve times.

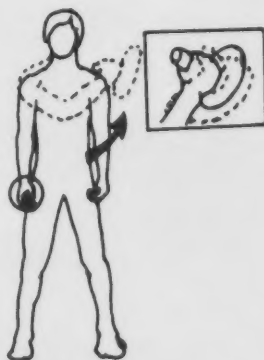
Phase 4. Repeat all Phases with left arm.

E. Speed: Raise two seconds and lower three seconds.



5. CROSS-OVER FRONT DIAGONAL LIFT:

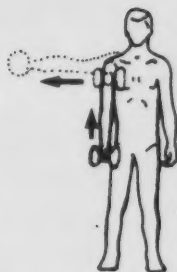
- A. Exercise Benefit: Adductors, shoulder girdle, anterior deltoid.
- B. Starting Position: Stand with feet comfortably apart, dumbbell at right side, knuckles pointing out (for right arm exercise).
- C. Starting Weight: Usually 3 to 5 pounds.
- D. Exercise Action:
- Phase 1. Keeping elbow straight at all times, slowly raise dumbbell diagonally in front and across body to horizontal position on left side. Slowly roll right forearm to pronated (palm down) position during the motion. Hold for four seconds.
 - Phase 2. Slowly return to starting position. Repeat twelve times.
 - Phase 3. Repeat Phase one and two with left arm.
- E. Speed: Raise two seconds and lower three seconds.



6. SHOULDER FRONT AND SIDE LIFT:

A. Exercise Benefit: Deltoids, triceps, biceps and forearm (wrist) extensors.

B. Starting Position: Stand with feet comfortably apart. Hold weight in right hand at your side, knuckles facing outward (for right arm exercise). Keep arm straight at all times.



C. Starting Weight: $3/4$ of maximum. Usually 3 to 5 pounds.

D. Exercise Action:

Phase 1. Lift arm forward to horizontal shoulder level. Hold for five seconds.

Phase 2. Keep arm horizontal while slowly moving arm out to right side. Hold for five seconds.

Phase 3. Slowly lower arm to starting position at the side of body. Repeat twelve times.

Phase 4. Repeat Phases one, two and three with left arm.

7. SHOULDER EXTENSOR STRETCH:

A. Exercise Benefit: Deltoid, chest, shoulder flexibility.

B. Starting Position: Lie on your back at the edge of a sturdy table. Hold dumbbell in right hand with arm straight toward the ceiling.

NOTE: If thin exercise bench is available both arms can be exercised at the same time.

C. Starting Weight: One to two pounds.



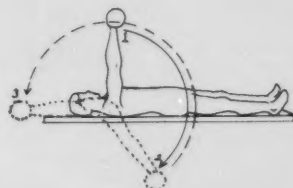
D. Exercise Action:

Phase 1. Slowly lower weight to the right side of hip and continue to below table surface until full right shoulder stretch. Hold stretch for five seconds.

Phase 2. Slowly raise weight to starting position and then continue slowly to maximum overhead stretching position. Hold for five seconds.

Phase 3. Slowly return to starting position. Repeat twelve times.

Phase 4. Repeat all Phases with left arm.



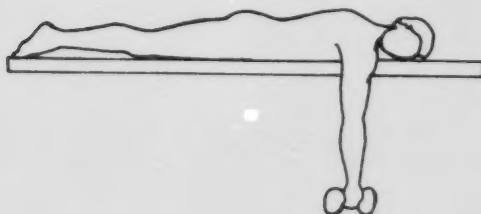
E. Speed: Very Slow.

F. Caution: Start with small weight, usually one to two pounds, as a large weight can cause considerable shoulder pressure.

8. SHOULDER BACK LIFT:

A. Exercise Benefit: Shoulder girdle, shoulder extensors.

B. Starting Position: Lie prone (on stomach) on a firm table or bench, arm hanging freely over the edge. Hold dumbbell in your right hand, (for right arm exercise) knuckles out.

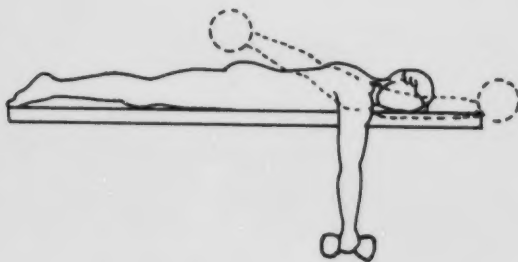


C. Exercise Action:

- Phase 1. Keeping elbow straight at all times slowly raise dumbbell upward as high as possible, hold for two seconds.
- Phase 2. Slowly lower arm as far backward as possible, hold for two seconds.
- Phase 3. Slowly return to starting position. Repeat twelve times.
- Phase 4. Repeat all Phases with left arm.

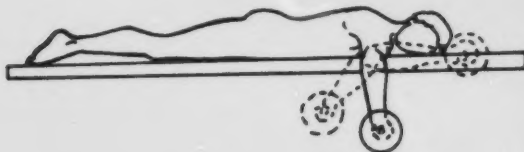
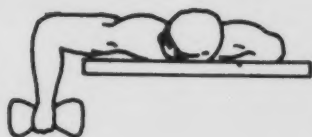
D. Speed: Raise two seconds, lower three seconds.

E. CAUTION: Start with small weight, usually 2 pounds as leverage from arm length can create substantial force at the shoulder.



9. SHOULDER ROTATION: (External and Internal)

- A. Exercise Benefit: Shoulder rotators and forearm extensors.
- B. Starting Position: Lie prone (on stomach) on a firm table or bench, front of shoulder supported at edge of bench. Pad shoulder with small cushion for protection. Raise right arm (for right arm exercise) to horizontal while bending elbow to ninety degrees so hand hangs down. Hold dumbbell in right hand with the with the knuckles pointing forward.
- C. Starting Weight: $3/4$ maximum. Usually 2 to 3 pounds.
- D. Exercise Action:
- Phase 1. Slowly raise dumbbell forward and up as far as possible, hold for two seconds, then slowly return to starting position.
 - Phase 2. Slowly raise dumbbell backward and up as far as possible, hold for two seconds, then slowly return to starting position.
 - Phase 3. Repeat Phase one and two twelve times.
 - Phase 4. Repeat all Phases with left arm.
- E. Speed: Raise one second and lower two seconds.



Arm Section

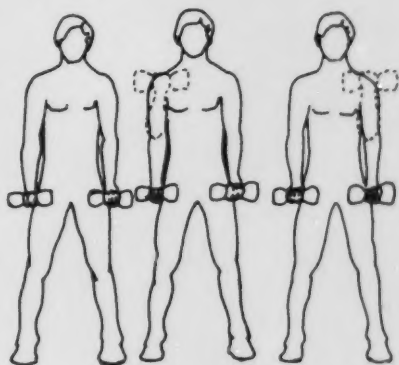
1. TRICEPS STRETCH-PRESS: (French Curl)

- A. Exercise Benefit: Shoulder stretch and triceps (upper arm).
- B. Starting Position: Stand with feet comfortably in balance, holding a dumbbell in each hand fully overhead.
- C. Starting Weight: $3/4$ maximum. Usually 3 to 5 pounds.
- D. Exercise Action:
 - Phase 1. Slowly lower dumbbells behind head to full elbow bend and front shoulder stretch. Hold abdomen and back firm. Hold for three seconds.
 - Phase 2. Slowly raise dumbbells to starting position.
 - Phase 3. Repeat twelve times.
- E. Speed: Lower, hold and raise three seconds each.



2. BICEPS CURL:

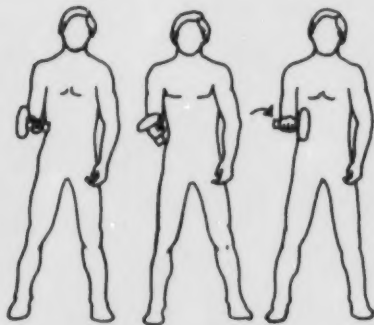
- A. Exercise Benefit: Wrist flexors, biceps, Brachialis.
- B. Starting Position: Stand comfortably in balance with dumbbell in each hand or barbell with both hands, palms facing forward with back of hands resting on thigh.
- C. Starting Weight: $3/4$ maximum. Usually 3 to 5 pounds.
- D. Exercise Action:
- Phase 1. Slowly raise right hand to shoulder level by bending elbow up. Keep abdomen and back straight and firm.
- Phase 2. Slowly lower right hand to starting position while simultaneously raising left hand to shoulder level.
- Phase 3. Repeat full right and left hand cycle twelve times.
- E. Speed: Raise two seconds, lower two seconds.



Forearm and Hand Section

1. FOREARM ROTATION:

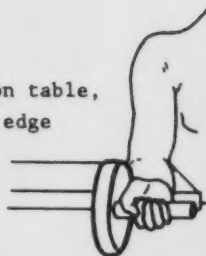
- A. Exercise Benefit: Forearm pronators and supinators.
- B. Starting Position: Sit in chair or stand with feet comfortably apart. Hold dumbbell in front of body with elbow bent to ninety degrees. Forearm supinated (palm up).
- C. Starting Weight: Usually 2 to 3 pounds.
- C. Exercise Action:
 - Phase 1. Slowly roll forearm to full pronated (palm down) position, then return to starting position.
 - Phase 2. Repeat up to thirty times.
 - Phase 3. Repeat Phase one and two with opposite arm.
- D. Speed: One second each roll.
- E. Note: Uni-weight is more effective for rotational exercise.



2. WRIST CURLS: (Flexors - Medial elbow)

A. Exercise Benefit: Forearm Flexors.

B. Starting Position: Sit in chair forearm resting on table, wrist and hand extending past edge of table. Hold weight with palm up and wrist stretched down.



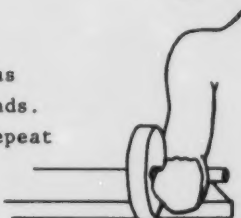
C. Starting Weight: Usually 3 to 5 pounds.

C. Exercise Action:

Phase 1. Lift hand (flex wrist) as high as possible and hold for five seconds.

Phase 2. Return to starting position. Repeat fifteen times.

Phase 2. Repeat Phases one and two with opposite arm.

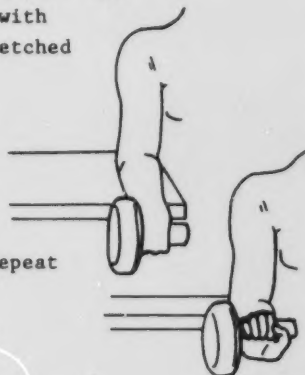


D. Speed: Moderate.

3. WRIST CURL: (Extensor - Lateral elbow)

A. Exercise Benefit: Forearm extensors.

B. Starting Position: Sit in chair forearm resting on table, wrist and hand extending past edge of table. Hold weight with palm down and wrist stretched down.



C. Starting Weight: Usually 2 to 3 pounds.

C. Exercise Action:

Phase 1. Lift hand as high as possible and hold for five seconds.

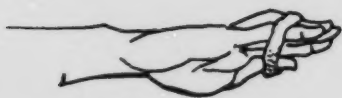
Phase 2. Return to starting position. Repeat fifteen times.

Phase 3. Repeat Phases one and two with opposite arm.

D. Speed: Moderate.

4. FINGER EXTENSION:

- A. Exercise Benefit: Strengthens forearm and finger extensors.
- B. Starting Position: Sit in chair and extend arm horizontally in front of the body. Keep elbow straight at all times. Place thick rubber band around thumb fingers between end finger knuckle joint.
- C. Exercise Action:
- Phase 1. Actively pull finger and wrist into fully straightened position. Hold for three seconds.
 - Phase 2. Release hand and return to starting position. Repeat until fatigue occurs.
 - Phase 3. Repeat Phases one and two with opposite hand.
- D. Speed: Moderate.



5. HAND SQUEEZE:

- A. Exercise Benefit: Strengthens forearm flexors and extensor muscles.
- B. Starting Position: Sit in chair and extend right arm horizontally in front of the body holding a tennis ball. * Keep elbow slightly bent.
- C. Exercise Action:
- Phase 1. Squeeze ball firmly and hold for three seconds.
 - Phase 2. Release ball and repeat until fatigue occurs.
 - Phase 3. Repeat Phases one and two with opposite hand.
- D. Speed: Moderate.
- E. Note: Start with nerf ball or racquet ball and progress to tennis ball. Progress slowly with each ball to fifty repetitions.



Uni-Weight:

Uni-weight is essentially a dumbbell weighted only on one end. A twelve inch handle allows increasing leverage as the uni-weight is held further from the weighted end. This system increases the efficiency of rotational exercise. By using the leverage principle a smaller selection of weights are needed (usually a 1,2,3 and 4 pound uni-weight are all that are needed for the average recreational athlete).



UNI-WEIGHT



UNI-WEIGHT LEVERAGE

Iso'-Flex Exercise*:

ISO'-FLEX exercise utilizes an elastic tension cord to supply increasing exercise resistance. ISO'-FLEX exercise is now the preferred system for early rehabilitative exercise at the Virginia Sportsmedicine Institute for the following reasons:

1. Full patient control (e.g., safety from overload).
2. Minimal equipment costs and storage (ISO'-FLEX can be carried in a pocket).
3. High exercise compliance because of convenience.
4. Effectiveness.

ISO'-FLEX exercises can be substituted for all equivalent resistance isotonic (weight) or isokinetic strength programs. Examples of the ISO'-FLEX Exercise System are illustrated below.



ISO'-FLEX WRIST



ISO'-FLEX FOREARM



ISO'-FLEX SHOULDER

***ISO'-FLEX EXERCISE SYSTEM**

Robert P. Nirschl, M.S., M.D.
 Medical Sports, Inc.
 Publishing Division
 3801 N. Fairfax Drive
 Arlington, Virginia 22203

Weight Machines and Barbells:

The transition from rehabilitative strength training for injury to maximum strength training for maximum power may be enhanced by the use of weight machines. Certainly recovery from injury must be complete before maximum intensity exercise is undertaken.

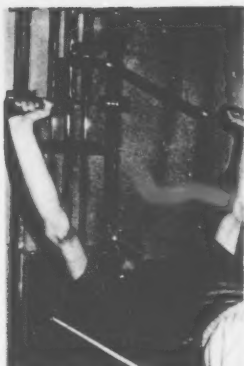
Heavy strength training is better suited to the bigger central muscles rather than the smaller forearm and hand muscles or the less powerful shoulder and arm rotators. The popular weight machines do not have effective isotonic exercises for the hand, forearm or shoulder rotators.

Since free barbell weight lifting and the weight machines use the forearm and hand to control the weights, it is recommended that any forearm-hand exercise be done last so as not to fatigue the smaller muscles before performing heavy exercise.

The weight machines commonly available are the Universal type gym and the Nautilus cam type systems. Nautilus offers some advantage regarding full range exercise as well as more efficient and consistent resistance but for the typical recreational athlete this advantage assumes much less importance than for the highly competitive or professional athlete who strives for the absolute maximum.



NAUTILUS



UNIVERSAL TYPE

Convenient housing of weights. Resistance is quite variable, dependent upon leverage changes during the range of motion arc of the exercise.

Isokinetic Exercise:

Isokinetic exercise is fixed-speed, variable resistance (usually hydraulic or electro-mechanical). Increased thrust by the exerciser results in an equivalent increase in machine resistance, but the pre-set speed of exercise remains the same. This concept offers definite advantages in injury rehabilitation as the exerciser controls the resistance. High speed exercise settings also decrease injury producing torque.

An additional advantage of pre-set high speed isokinetic exercise is that the strength training speed may be set to more closely resemble the high speed muscle action needed for sport performance.



CYBEX

ARM EXERCISE

Isokinetic exercise offers some advantages in injury rehabilitation.

EXERCISE PROGRAM WRAP UP

For arm injury rehabilitation, ISO'-FLEX or isotonic dumbbell programs are both effective. ISO'-FLEX however, is more convenient with higher compliance to complete the exercises.

Light Cybex isokinetic exercise is also helpful in the early rehabilitative phases, since like ISO'-FLEX, the exercise intensity is totally controlled by the patient.

Proper warm-up followed by the flexibility program are important prior to starting each rehabilitative strength exercise session. Counter Force brace protection in the the first week of rehabilitation exercise adds extra precaution.

Once injury is resolved, heavier strength training programs may be started. This can include heavy barbells, weight machines, full Cybex isokinetics or super strength ISO'-FLEX.

Maintenance exercise is recommended to maintain strength as "playing one's sport" is not enough to maintain strength in all muscle groups.

Chapter XI

Return to Sports

Specifics for Full or Modified Program

The ideal parameters for full return to sports include:

1. Full healing of injured tissue.
2. Full strength, flexibility and endurance return of all tissues.
3. Proper aerobic and anaerobic conditioning.
4. No residual tissue inflammation
5. Control of abusive force loads by:
 - a. Alteration of sports techniques.
 - b. Proper equipment (type, weight and size).
 - c. Counter Force (C Force) brace protection.

On many occasions, however, it is appropriate and beneficial to allow a return to sports on a limited basis. This not only offers definite psychological and motivational advantages, but also enhances physical improvement by use of sports specific activities. The following categories of sports return (dependent upon physical condition) are commonly employed at the Virginia Sportsmedicine Institute.

Modified Return to Sports

CATEGORY I - Full Competition (Play to Win) No restrictions:

1. Phase I pain or less (stiffness after activity).
2. Able to complete all exercises (ISO'-FLEX or Isotonic).
3. Full joint motion.
4. No strength deficit (Cybex or Dynamometer equivalent).

5. Proceed as follows:

- a. C-Force brace protection during activity (elbow or wrist) for a minimum of two months.
- b. Proper warm-up and flexibility programs before activity.
- c. Normal sports activity.

NOTE: Do maintenance rehabilitation strength exercises every other day after proper warm-up.

CATEGORY II - Modified Competition: Play in a relaxed manner:

1. Phase II pain (stiffness before and after activity).
2. Able to complete all exercises without pain (ISO'-FLEX or Isotonic).
3. Full joint motion.
4. Less than five percent strength deficit (Cybex or Dynamometer equivalent).

5. Proceed as follows:

- a. C-Force brace protection (wrist or elbow) at all times of sport activity.
- b. Proper warm-up and flexibility programs before activity.
- c. Groove strokes or patterns for thirty minutes.
- d. Easy competitive play; concentrate on smooth motions; use 75% of available power (use tennis stroke, throwing or swimming schedule as described in the addendum).
- e. Ice after play.
- f. If Phase III pain occurs, down grade to Category III, Sports Return (no competition).

NOTE: Do rehabilitative exercises daily after proper warm-up.

CATEGORY III - No Competition: Groove non-painful strokes or motions only - Do not keep score.

1. Phase III pain (Mild pain with activity).
2. Able to complete 75% exercise repetitions (ISO'-FLEX or Isotonic).
3. Mild restriction of motion.

4. Less than ten percent strength deficit (Cybex or Dynamometer equivalent).
5. Proceed as follows:
 - a. C-Force brace protection (elbow or wrist) at all times of activity.
 - b. Proper warm-up and flexibility programs before activity.
 - c. Groove motions only; avoid any painful strokes or motions; use stroke or activity schedule as described in the addendum.
 - d. Ice after play (thirty minutes on - thirty minutes off).
 - e. If Phase IV pain, stop play.

NOTE: Do rehabilitative exercises daily after proper warm-up; stop sports play if rehabilitative exercises become painful or more difficult.

CATEGORY IV - No Sports.

1. Phase IV or V pain (constant pain or major pain with activity).
2. Unable to do exercises without Phase IV pain.
3. Strength deficit over 20% (Cybex or Dynamometer equivalent).

Sports Specific Activities

No one sport or exercise activity is perfect for total conditioning. A total program includes full balanced strength, endurance and flexibility exercises of all muscles groups. In addition, full aerobics and anaerobics (no initial muscle oxygen use) plus heat conditioning complete the program.

Muscles are used in a very specific way with each sport activity. This use is quite different than the muscle use in conditioning exercise. To be fully sport conditioned therefore, one must play the sport with proper intensity and duration.

It is recommended that supplemental exercise be utilized to supplement the gaps in sports specific activities. It is further

recommended, however, that sports play be gradually introduced (see sports return categories). Sports return must be gradual and fully controlled concerning intensity and duration. The sequence of re-introduction of the various sports patterns (see appendix - stroke and motion pattern schedules) should start with uninjured areas.

SPORTS TRAINING METHODS:

As noted, sports specific exercise is important for sport training and body conditioning for that sport. As further noted, however, training in one sport leaves significant conditioning gaps which must be filled with supplemental exercise.

Since each sport has general as well as specific needs (e.g., aerobic, anaerobic, strength, endurance, flexibility and heat conditioning), it is a distinct mistake to attempt the development of all these needs by only participating in one sport or exercise. This approach not only leaves serious conditioning voids, but also invites injury to vulnerable body parts secondary to repetitive overload.

Examples of vulnerable areas include:

1. Shoulder in swimming, baseball and tennis.
2. Elbow in baseball, tennis.
3. Wrist in tennis, baseball.
4. Nerve pinch in baseball and tennis.

Recommendations:

1. Do not play sport for total conditioning program.
2. Play sport for skill level and sports specific conditioning. Use alternative exercise programs (which do not overload vulnerable areas) to accomplish established goals;

Examples:

- a. Substitute appropriate land exercises for swimming exercises in swimmers.
- b. Substitute strength and flexibility training for tennis and baseball sports activities.

3. Be careful of training techniques which increase overloads to vulnerable areas;

Example:

- a. Ankle and leg restraints (pull buoy, ankle lock, etc.) in swimming may result in shoulder overload.



TUBULAR ANKLE LOCK
A COMMON TRAINING TECHNIQUE
ELIMINATES LEG ACTION
WHEN SWIMMING



PULL BUOY MAY ALSO
CAUSE SHOULDER OVERLOAD

PROTECTIVE SEQUENCE FOR SPORTS ACTIVITIES:

For prevention of injury or protection from recurrent injury the following concepts are recommended for sports or occupational activity.

1. If stiffness is present, take 2 buffered aspirin (with your physician's approval) fifteen minutes before activity.
2. Do proper warm-up before activity (see section on warm-up).
3. Do proper flexibility exercise after warm-up (see Flexibility Program).

4. Apply Counter Force brace to support injured or vulnerable area.
5. Apply joint warmer over Counter Force brace.
6. Eliminate abusive force overloads from activity (see Control of Force Loads).
7. Modify activity intensity as indicated (see Modified Sports Return Categories - see Pain Phases).
8. Proceed with activity.
9. Remove warmer during activity if appropriate.
10. Complete activity.
11. Remove Counter Force brace.
12. Ice application to any sore or inflamed areas (30 minutes on - 30 minutes off).
13. Repeat buffered aspirin when indicated.

Chapter XII

Control of Force Loads

The basics for controlling potentially abusive overloads include:

1. Medically proper sports technique.
2. Medically proper sports training methods.
3. Proper sports intensity and duration.
4. Protective Counter Force bracing.
5. Proper equipment type, size and weight.

Medically proper sports technique and Counter Force bracing have been discussed. Discussion of proper equipment is equally important.

EQUIPMENT CHANGES:

Although we are all of different size, shape and strength, it is curious to note how many implements are standard in size and weight. Thus children and grown ups, male and female, often use the same size handles, whether a tennis racquet, hammer, shovel, or garden tool. Clearly these standard sizes do not work efficiently for everyone, and on occasion can be a distinct disadvantage for the activity as well as potentially harmful.

Rules to follow when choosing equipment are:

1. Select equipment that best fits your body proportions (grip size, weight, height, etc.). See section on Proper Grip Size.
2. Select equipment that will increase your mechanical leverage advantage.
3. Select equipment that will absorb shock or control torsion. See section on Choosing a Tennis Racquet.

PROPER GRIP SIZE: Tennis Racquets and Other Hand Held Implements.

Regardless of which tennis grip style you use, you will have problems stroking the ball properly unless your racquet is the proper grip size. If the grip is too big you'll have trouble holding on to the racquet, especially on very hot days when your hands sweat. Too

small a grip will result in poor torsion control or can cause blisters.

For years, sporting goods salesmen and pro shop assistants have fitted grips mainly on the basis of trial and error, asking you how a particular grip "feels". In the golf shop, hardware store, bike shop, etc. often no choice is offered or available at all.

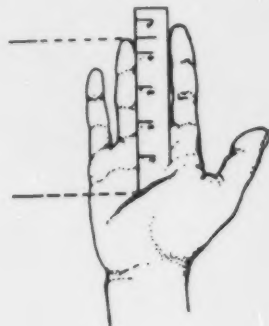
There is a simple, accurate way to check grip size, one that anyone can easily check himself. It is by using the "Nirschl palm-crease factor" in measuring the true length of the ring finger.*

Look at the palm of your hand. Notice the creases. The bottom crease, running along the middle portion of the hand, is the one you want. If you take a ruler (see drawing) and measure from the tip of your ring finger to a point on the crease between the ring and middle fingers, you should be able to determine the grip you need. If the measurement comes out to $4\frac{1}{2}$ inches, for example, then that is the correct grip size for you.

If you are a man, chances are your grip will measure between $4\frac{1}{2}$ and $4\frac{3}{4}$ inches. The average woman's grip falls between $4\frac{1}{8}$ and $4\frac{3}{8}$ inches. Children's grips, of course, run smaller.

Determining the proper grip size is even easier using the Hand'-Sizer (see addendum).

If you find that the grip you are using now is too big or too small, the adjustment can be made easily and inexpensively at any good tennis shop. And when you go to get the grip adjusted, tell the pro about this technique. You will be doing the next customer a favor.



*Nirschl, R.P., M.D.: Tennis Elbow, Orthopedic Clinics of North America, Vol.4, No.3, July 1973, p.797.

PROPER EQUIPMENT WEIGHT:

Hand held implements come in a variety of sizes and weights. Theoretically the heavier the implement (e.g., tennis racquet, baseball bat, hammer, etc.) the greater the momentum (e.g., impact force) with the same implement velocity (speed).

In a high skill sport such as tennis or baseball however, timing (including body weight transfer) and proper impact position are more important factors than implement momentum per se. Thus a heavy racquet or bat in poor position is a potential injury producer. For most recreational athletes with limits on muscular strength and skill, a light racquet or bat is best.

Youngsters often lack strength to control even an adult light racquet or bat. In this circumstance, special smaller youth racquets or the use of two hands is a must.

TENNIS RACQUETS:

In the last decade the number of tennis racquets and their variety in design and materials have multiplied at an amazing rate.

It is quite clear that some racquets, because of greater torsion control and shock absorption, are more protective than others. Experience and statistical analysis over the years have led me to make the following recommendations:

1. Avoid excessively flexible or excessively rigid racquets.
2. Avoid tightly strung racquets (medium soft string tensions in the 52-54 pound range for regular size racquet frames are best). For mid and oversize racquets medium soft tension is appropriate, as well. The string tension recommendations of the manufacturer should be decreased by two to three pounds for extra pre-caution.
3. Avoid head-heavy racquets. Evenly balanced racquets are best, unless you are extremely skilled and powerful in the arm. Racquet weights in the 12-12½ ounce range are best.

As a general rule, aluminum alloy racquets, especially of the OPS design, and graphite composite racquets have been the most protective for sensitive arms. Avoid racquets in which vibration is noted on mis-hit balls. Proper grip size is a must.

Mid-size racquet frames may offer, some advantage over standard size frames. The extreme jumbo racquets statistically appear to be more troublesome for sensitive arms than mid-size.

My present recommendation for sensitive arms include:

1. Mid-size racquet.
2. Graphite composite (may be wood, metal or fiberglass) or metal alloy with OPS design. Many of the better racquets are low-medium in price. Do not mistake high price as a guarantee for quality.
3. Quality nylon string with medium soft string tension (see section on strings).
4. Try the racquet for playability to your game.
5. Do not play with a racquet which transmits noticeable vibration to your hand.
6. As technology changes, improvements may be anticipated. Be alert for technological advances.

RACQUETBALL AND SQUASH RACQUETS:

Racquetball and squash racquets are lighter, smaller and shorter than tennis racquets. These characteristics make these racquets less important as a cause of force overload. Good racquetball and squash sport technique is a must however, to prevent the wrist and elbow problems as presented earlier in this book.

RACQUET STRINGS:

The traditional 16 gauge size appears best for tennis racquets. Natural gut seems superior for shock absorption but with early deterioration (often 4-6 weeks), this advantage is quickly lost.

Since most quality nylons have much better longevity, nylon is recommended for the non-professional player. As noted, string tension

for vulnerable or sensitive arms should be medium soft. A tightly strung racquet is hazardous to sensitive muscles and tendons.

TENNIS BALLS:

Although all tennis balls by USTA specifications weigh two ounces, the co-efficient of restitution of some ball materials produce higher impact forces. The solid core balls are especially troublesome on sensitive arms and are best avoided when injury and pain symptoms have occurred.

A further problem of increased force load hazard occurs when balls pick up water (such as playing on watered red clay surfaces) and therefore extra weight. To avoid injury, in these circumstances, change balls often and hit with slower speeds.

Dead practice balls also pose a definite hazard. It is ill-advised to hit multiple shots against a backboard or practice serves with dead balls which have lost resilience. The injury potential in this circumstance is extremely high.

BASEBALL BATS:

Baseball bats, like tennis racquets are available in various lengths, weights and materials. Like racquets proper grip size, plus weight and length to allow proper timing and technique are more important than actual bat momentum.

Fortunately, the two handed technique of baseball batting is protective to the elbow. Unlike tennis, there are relatively few elbow or shoulder tendinitis overloads caused by baseball batting.

PLAYING SURFACES:

Tennis courts now are available in multiple surface varieties. Fast surfaces such as cement or asphalt increase ball velocity thereby increasing impact forces. High velocity also results in additional timing and technique problems. Uneven surfaces (such as grass) result in bad bounces which are also hazardous.

The ideal surface is moderate to slow and well groomed. Har-tru clay is excellent if well maintained but not heavily watered at the time of play.

If only hard surfaces are available, play with slower hitting players and work for stroke consistency and ball control.

BASEBALL DIAMOND:

The baseball diamond, is fortunately scaled to adult and "little league" sizes. This decreases excessively long throws for little arms and is a definite help for youngsters to prevent growth line problems (little leaguer's elbow).

A key factor in the baseball playing field is the grooming of the field. "Bad Bounces" from rough or rocky fields can cause impact injury and also result in hurried and exaggerated throws which invites arm injury. Good grooming of the baseball diamond therefore, is a must at all age levels.

Chapter XIII

Surgery

On occasion the conservative treatment effort will be unsuccessful. In our series of shoulder and elbow tendinitis (which now exceeds 3,500 cases) approximately eight percent of patients require surgery. NOTE: This statistic is somewhat weighted because of the high referral nature of my patient population.

The indications for surgery vary somewhat and again are highly individualistic. Some persons might merely avoid all activities which cause symptoms and therefore elect to live with their problem. Most however find their sports and recreational activities important for social, health or economic reasons. Since the quality of life is therefore adversely affected, a surgical solution is appropriate.

BASIC REASONS FOR SURGERY:

1. Lack of response to conservative treatment.

Note: Failure to respond to a poor conservative program or lack of patient compliance to an adequate program does not qualify. A proper effort with a good program (as presented in this book) should be instituted before failure is accepted.

The following clinical signs have been noted to be present more often when failure of the conservative treatment occurs:

- a. The patient has received three or more cortisone injections. Note: Cortisone by injection is a superb anti-inflammatory (peripheral pain reliever) at the injection site. It does not, however, promote healing and tends to be derogatory long term by weakening the tendon. The technique of injection as well as the kind of cortisone and number of injections are all important in determining the ultimate effect of the injection.

- b. Easy flow of injected Cortisone (lateral elbow).

Note: My indication for cortisone injection is when pain is such that compliance with the conservative treatment plan is compromised. This occurs approximately twenty percent of the time.

My injection technique for the lateral elbow is below the Extensor Brevis tendon. Easy flow of the cortisone indicates significant tear or change of the tissue in this region.

- c. Positive shoulder arthrogram. Special shoulder x-ray using a dye which shows tear in the tendon cuff. Note: a normal arthrogram test does not rule out a tendon tear.
- d. Presence of calcium deposits on x-ray; shoulder or elbow. This occurs approximately twenty-two percent of the time.
- e. Presence of multiple tendonitis and nerve pinch symptoms. Some patient's have shoulder tendonitis in both shoulders, tennis elbow in both elbows, or wrist nerve pinch. This occurs approximately fifteen percent of the time.

2. Significant alteration of the quality of life.

Some patient's find the intensity and chronicity of their pain extremely compromising to their social, physical, emotional or economic well being.

IF SURGERY IS SELECTED:

Once it is elected to proceed with surgery other important factors must be considered:

- a. The surgical technique:

Surgical techniques have changed markedly in recent years. The older concepts of wrist, elbow and shoulder surgery were primarily designed for non-athletic more elderly persons. Key changes in technique have been made as recently as 1981.

- b. A quality supervised post-operative rehabilitation program: The program in this book is well suited for the post-operative period. For full success you must do your part!

SOME TECHNICAL THOUGHTS:

As noted above, surgical techniques have been evolving dramatically in recent years. My own extensive surgical experience has lead to some concepts you should know. These newer concepts have been extremely helpful in improving the surgical success rate while decreasing the post-op rehabilitative time and effort. Discuss them with your surgeon before any contemplated surgery. Make sure as well that your doctor is a well qualified orthopedic surgeon with a good understanding of athletic problems.

WRIST SURGERY:

The need for wrist surgery is generally low. The following outline of some pertinent points should help:

1. Rule out fracture or dislocation of small wrist bones.

Note: high quality special wrist x-ray views are often needed.

2. Limited removal and repair of injured tissue.

Note: The common problems are the Ulnar Collateral ligament and triangular cartilage. Both respond well to limited surgical correction.

3. Limited release of nerve pinch.

Note: Nerve pinch at the wrist occurs with the median and ulnar nerves. Both respond well to release by well placed limited incisions.

ELBOW SURGERY:

1. The pathology (injury) is usually located in the area of maximum tenderness to touch. Note: These areas generally are:

- a. Lateral elbow - Extensor Brevis tendon.

- b. Medial elbow - Pronator Teres and Flexor Carpi Radialis. tendons.

- c. Posterior elbow - Triceps tendon.

It is usually best to remove and repair only those tissues involved in the injury. Older surgical techniques releasing normal tissues tend to produce poor results, produce weakness, and prolong rehabilitation time.

2. If Ulnar nerve pinch occurs at the elbow, surgical release will help. In most (not all) instances, it is unnecessary to transfer the nerve forward. ~~Note~~ In the past, Ulnar nerve transfer was thought to be necessary for operative success.
3. If calcium deposits occur, removal is appropriate, but under some circumstances not always necessary.

SHOULDER SURGERY:

1. Pathology (injury) is usually in the anterior Rotator Cuff tendon close to, but not usually involving the biceps tendon.
2. Incisions should protect the normal Deltoid muscle and Acromion bone. Note: Standard operative techniques often remove the Acromion bone in a way which may weaken the Deltoid muscle attachment. In most instances this is not necessary to the success of the operation and may result in prolonged shoulder weakness (sometimes permanent) and prolonged rehabilitative periods.
3. Removal of calcium spurs from the end of the collar bone (clavicle), release of the tight shoulder (Coraco-Acromial) ligament, and rotator cuff tendon repair, can in most instances, be accomplished through limited well placed incisions without harming normal tissues or altering the Acromion bone.

FINAL SURGICAL THOUGHTS:

The success of surgery is dependent upon many things. Certainly the surgeon must do his part. You as the patient must be prepared to do your part as well. Postive mental attitude and the resolve to work hard in the rehabilitation effort are key factors to success.

Although no surgery can be guaranteed, with the above thoughts in mind, a high level of surgical success can be anticipated.

SUMMING IT UP

The recreational boom is upon us. The benefits of athletic participation far outweigh the hazards. Nonetheless, problems do occur. I believe, however, that the large majority of arm injuries can be resolved or prevented by the techniques as outlined in this book. There are very few excuses not to exercise. In fact, non-exercise is more hazardous to your health!

Chapter XIV Addendum

Warm-Up Cool Down Routines

BASEBALL PITCHING WARM-UP:

Check with your doctor and get his approval concerning the following routine.

To pitch a seven or nine inning game takes sensational body and arm strength plus stamina. Proper total body strength, endurance, flexibility, aerobic and heat training should long precede any attempt at competitive pitching.

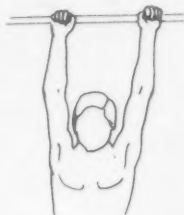
Each warm-up pitch may increase arm fatigue later in the game. Throw only enough hard pitches to groove your motion. The major part of the warm-up should not include actual pitching.

PHASES OF WARM-UP:

- Phase 1. If mildly stiff, take two buffered aspirin (with doctor's approval) thirty minutes before game time.
NOTE: Phases 2 and 3 should be included in your routine if facilities and personnel permit; otherwise go on to Phase 4.
- Phase 2. One hour before game, heat shoulder and elbow with heating pad, hot shower, etc., for five minutes.
- Phase 3. Massage the shoulder and elbow for five minutes with mineral oil or a methyl salicylate product (Craemergesic, Ben-Gay, etc.). If a trainer is available, keep your arm elevated on two pillows and have him massage your arm from hand to shoulder.
- Phase 4. When on the field, jog or do jumping jacks until light sweat occurs.

Phase 5. Do the flexibility exercises as noted on pages (40-43)
NOTE: These flexibility exercises can be done before
Phase 4 if Phases 2 and 3 were completed.

Phase 6. Fully relax and hang with both hands
from a chinning bar for sixty seconds
(see illustration).



Phase 7. Do your usual flexibility program
for back and legs.

Phase 8. Do your usual pre-game grooving and
agility drills. NOTE: Throw only
enough to groove your motion. Do
not cause fatigue.

Phase 9. Start easy throwing about one-half the usual distance
and gradually lengthen throws to full distance.

Phase 10. When arm is loose, throw a few hard pitches to groove
your final competitive motion.

Phase 11. Keep your warm-up jacket on at all times when not
pitching in the game. If the day is cold and damp,
consider wearing a thermal undershirt.

Phase 12. If undershirt becomes sweated you may chill
excessively. Change to a dry undershirt in a warm area
(car or bus if necessary).

BASEBALL PITCHING COOL-DOWN:

1. Take two buffered aspirin (if your doctor approves)
immediately after completing activity.
2. Take a quick shower, keeping arm elevated. Dry thoroughly.
3. Lie down and elevate arm on two pillows.
4. Apply crushed ice in bags to medial elbow and shoulder.

NOTE: Ice Strap is extremely helpful for convenience and
effectiveness. If necessary take ice to playing area
in a thermos or cooler.

5. Squeeze racquet ball or nerf-type ball gently while elevating and icing the arm.
6. Ice arm for a minimum of one-half hour. If arm is badly swollen, ice and elevation may be indicated for two hours or more (30 minutes on and 30 minutes off). Be sure skin is protected from frostbite, (avoid excessive skin redness).
7. If arm is badly swollen, an air compression device, if available, will help eliminate the swelling (see Jobst Compression Splint page (31)).
8. When major swelling is gone (usually next day) you may throw lightly only after warm-up. Return to pitching rotation when no further pain or swelling exists (usually four days for a professional pitcher).

TENNIS WARM-UP:

Tennis warm-up is similar to baseball in the early phases. Basic tennis motions are more protective than baseball. Tennis is also more consistent than the intermittent activities of baseball pitching. In warm weather, therefore, it may be unnecessary to complete all tennis warm-up phases.

PHASES OF WARM-UP:

- Phase 1. If mildly stiff, take two buffered aspirin (with your doctor's approval) thirty minutes before the time of each match.
- Phase 2. If weather is cool, warm arm with infra-red lamp, heating pad, hot shower, etc., for five to ten minutes.
- Phase 3. Massage shoulder and elbow for two minutes with a methyl salicylate product (Craemergesic, Ben-Gay, etc.).
- Phase 4. Do jumping jacks or jog until light sweat occurs.
- Phase 5. Do the following flexibility exercises as noted on pages (40-43).
- Phase 6. Do your usual back and leg flexibility exercises.

Phase 7. Do your usual pre-match stroke grooving and agility drills. Note: Hitting easy overheads first is more efficient in getting all body parts involved early.

TENNIS COOL-DOWN:

If no injury symptoms are present, no specific cool-down is indicated. If shoulder, elbow, or wrist symptoms are present, however, the program as outlined for baseball may be indicated. In general, major swelling is unlikely to occur following tennis.

SWIM WARM-UP:

Swimming involves a variety of circumstances. In the nice heated environment of an outdoor sun drenched pool, warm-up is easily attained. The major hazard occurs to highly competitive swimmers who often practice long hours in the relatively cool air environment of indoor pools. In this circumstance attention to full warm-up may be critical, yet is often not done (unfortunately inviting injury).

Check with your doctor and get his approval concerning the following routine.

PHASES OF WARM-UP:

- Phase 1. If mildly stiff take two buffered aspirin (with doctor's approval) thirty minutes before water entry.
- Phase 2. Take warm shower for three minutes - stretch shoulder while in shower.
- Phase 3. Massage shoulder vigorously with methyl-salicylate (Craemergesic, Ben Gay, etc.) product for three minutes.
- Phase 4. Put warm-up jacket on.
- Phase 5. Get sweat-up by doing jumping jacks, jogging, etc.. Make sure floor is dry - be careful not to slip.
- Phase 6. Do flexibility exercises as noted on pages (40-43).

- Phase 7. Fully relax and hang with both hands from a chinning bar for sixty seconds (see page 84).
- Phase 8. Do your regular back and leg flexibility routine.
- Phase 9. Remove warm-up jacket.
- Phase 10. Enter water; proceed with gradual increase in stroke intensity.

Practice Schedules

Tennis Practice Schedule Following Injury:

1. Lateral Tennis Elbow: p. 88
2. Medial Tennis Elbow: p. 89
3. Tennis Shoulder: p. 91

LATERAL TENNIS ELBOW PRACTICE SCHEDULE

Progress If No Pain Increase

<u>TOURNAMENT</u>	<u>PLAYER</u>	<u>RECREATIONAL</u>	<u>PLAYER</u>
Day 1	15 min. - F only	Day 1	15 min. - F only
Day 2	20 min. - F; FL; few FV	Day 2	30 min. - F; FL; few FV
Day 3	30 min. - F; FL; FV; Few O (to F court only)	Day 3	35 min. - F; FL; FV; Few O
Day 4	35 min. - F; FL; FV; O; Few S	Day 4	45 min. - F; FL; FV; O;
Day 5	40 min. - F; FL; FV; O; S (no SL,T, or AT)	Day 5	1 hour - F; FL; O; S; Few B (2 handed)
Day 6	45 min. - as day 5	Day 6	1 hour - F; FV; FL; O; S; BV (2 handed); B
Day 7	1 hour - as day 6	Day 7	1 hour F; FV; L; O; S; B; BV (2 handed); B
Day 8	1 hour - F; FL; FV; O; S; (no SL or AT) few B (2 handed)	Day 8	1 hour F; FV; L; O; S; B
Day 9	1 hour - F; FL; FV; O; S (no AT); B; (no BV)	Day 9	Resume normal practice play schedule
Day 10	1 hour (A.M.) F;FV; L; O; S; (no AT) B; (no U)	Day progression for recrea-	
	15 min. (P.M.) F; FL; O	tional player refers to actual	
Day 11	1 hour (A.M.) - as day 10	playing days not chronological	
	20 min. (P.M.) - as day 10	days.	
Day 12	1 hour (A.M.)- as day 11	*****	
	30 min. (P.M.) - F; FV; L; O;	* USE LATERAL C FORCE BRACE *	
Day 13	1 hour (A.M.) - F; FV; L; O; S; B; few BV (no U)	* AT ALL TIMES *	
	45 min. (P.M.) - F; FV; L; O; S	* HIT EASILY - HIT THROUGH *	
Day 14	1 hour (A.M.) - F; FV; L; O; S; B; BV	* STAY IN BALANCE *	
	1 hour (P.M.) - as A.M.	* STAY IN HITTING ZONE *	
Day 15	Resume normal practice - Play schedule	* NO LATE STROKES *	
		* KEEP EYE ON BALL *	
		* TWO HANDED BACKHAND IS *	
		* PROTECTIVE *	
		* ICE SORE AREAS *	
		* IMMEDIATELY AFTER PLAY *	

F = Forehand	B = Backhand	S = Serve
FV = Forehand Volley	BV = Backhand Volley	SL = Slice
U = Underspin	T = Topspin	AT = American Twist
FL = Flat	O = Overhead	FL = Forehand Lob
BL = Backhand Lob	L = Lob (either F or B)	

MEDIAL TENNIS ELBOW PRACTICE SCHEDULE

Progress if No Pain Increase

TOURNAMENT PLAYER

Day 1 15 min. - B only (2 handed); L
(NO LATE STROKES)

Day 2 20 min. - B (2 handed); L; Few
F (2 handed)

Day 3 30 min. - B; L; Few F (no T)

Day 4 35 min. - B; L; BV; F (no T)

Day 5 40 min. - B; L; BV; F (no T)
few O (to F court only)

Day 6 45 min. - B; L; BV; F; (no T)
O (to F court only)

Day 7 1 hour - same as day 6

Day 8 1 hour - B; L; BV; F (no T)
P; FV; (no late
strokes ever!)

Day 9 1 hour - B; L; BV; F; (no T)
O; FV; few S (no T
or AT)

Day 10 1 hour - (A.M.) as day 9
15 min. - (P.M.) B; L; F

Day 11 1 hour - (A.M.) B; L; BV; F;
(no T) O; FV; S;
(no T or AT)

30 min. - (P.M.) B; L; BV; F;
(no T)

Day 12 1 hour - (A.M.) B; L; BV; F;
O; FV; S; (no T or AT)

45 min. - (P.M.) B; L; BV; F; O

Day 13 1 hour - (A.M.) same as day 12
1 hour - (P.M.) same as A.M.

Day 14 1 hour - (A.M.) B; L; BV; F;
1 hour - (P.M.) as A.M.

RECREATIONAL PLAYER

Day 1 15 min. - L only

Day 2 20 min. - L; B

Day 3 30 min. - L; B; F;
(no late strokes)
(no topspin ever!)

Day 4 40 min. - L; B; F; BV;

Day 5 45 min. - L; B; F; BV;
few O

Day 6 1 hour - L; B; F; BV;
O

Day 7 1 hour - L; B; BV;
F; O; few S

Day 8 1 hour - L; B; F; BV;
O; S; F
(no late strokes ever!)

Day 9 Resume normal practice
play schedule

Day progression for recrea-
tional player refers to
actual playing days not
chronological days.

* USE MEDIAL C FORCE BRACE *
* AT ALL TIMES *

* HIT EASILY - HIT THROUGH *

* STAY IN BALANCE *

* STAY IN HITTING ZONE *

* NO LATE STROKES *

* KEEP EYE ON BALL *

* AVOID FRAME SHOTS *

* ICE SORE AREAS *

* IMMEDIATELY AFTER PLAY *

F = Forehand

FV = Forehand Volley

U = Underspin

FL = Flat

BL = Backhand Lob

B = Backhand

BV = Backhand Volley

T = Topspin

O = Overhead

L = Lob (either F or B)

S = Serve

SL = Slice

AT = American Twist

FL = Forehand Lob

TENNIS SHOULDER PRACTICE SCHEDULE

Progress If No Pain Increase

<u>TOURNAMENT</u>	<u>PLAYER</u>	<u>RECREATIONAL</u>	<u>PLAYER</u>
Day 1	30 min. - F; FV; L	Day 1	30 min. - F; FV; L
Day 2	45 min. - as day 1	Day 2	45 min. - as day 1
Day 3	45 min. - F; FV; L; B (low-waist high or below)	Day 3	1 hour - as day 1
Day 4	45 min. - as day 3	Day 4	1 hour - F; FV; L; B
Day 5	1 hour - F; FV; L; B; few BV (low-waist high or below)	Day 5	1 hour - F; FV; L; BV
Day 6	1 hour - F; FV; L; B; BV (low)	Day 6	1 hour - as day 5
Day 7	1 hour - as day 6	Day 7	1 hour - F; FV; L; B; BV; Few O (easy)
Day 8	1 hour (A.M.) as day 7	Day 8	1 hour - as day 7
	30 min. (P.M.) F; FV; L; B; BV; (low)	Day 9	1 hour - F; FV; L; B; BV; O; S (easy)
Day 9	1 hour (A.M.) F; FV; L; B;	Day 10	1 hour - as day 9
Day 10	1 hour (A.M.) F; FV; L; B; O (easy) few S (easy)	Day 11	1 hour - F; FV; L; B; BV; O; S
	1 hour (P.M.) - as in A.M.	Day 12	Return to normal practice - play schedule
Day 11	1 hour (A.M.) F; FV; L; B; BV; O (easy) S (easy)		
	1 hour (P.M.) -as A.M.		
Day 12	1 hour (A.M.) - F; FV; L; B; BV; O; S (easy)		
	1 hour (P.M.) - as A.M.		
Day 13	1 hour (A.M.) - F; FV; L; B; BV; O; S		
	1 hour (P.M.) - as A.M.		
Day 14	As day 13		
Day 15	Return to normal practice and play.		

Day progression for recreational players refers to actual playing days not chronological days.

 * HIT EASILY - HIT THROUGH *
 * STAY IN BALANCE *
 * STAY IN HITTING ZONE - *
 * BALL TOSS FORWARD *
 * KEEP EYE ON BALL *
 * ICE SORE AREAS *
 * IMMEDIATELY AFTER PLAY *

F = Forehand	B = Backhand	S = Serve
FV = Forehand Volley	BV = Backhand Volley	SL = Slice
U = Underspin	T = Topspin	AT = American Twist
FL = Flat	O = Overhead	FL = Forehand Lob
BL = Backhand Lob	L = Lob (either F or B)	

Swim Shoulder Practice Schedule Following Injury:

Swimming like tennis does offer some options in stroke patterns. In general a return to the water can be accommodated by avoiding the painful stroke pattern (e.g., backstroke, freestyle, breaststroke, or butterfly). The stroke patterns most often noted to cause shoulder pain are the butterfly and freestyle.

When to return to a previously painful stroke pattern should be totally determined as outlined in the criteria for Return to Sports (see page 66). When the stroke is begun, the progression, intensity and duration are highly individualistic; unfortunately no accurate criteria can be developed. In general, slow smooth strokes with steady gradual build-up works best. The major mistake is attempting too much too soon. Sports specific muscle-tendon training takes time. An average return schedule is as follows:

1. May swim with full duration and intensity of any stroke pattern which did not previously or does not presently cause pain.
2. Return to previously painful stroke patterns with caution.
NOTE: A careful analysis of all stroke patterns by a competent coach is a must for detection of any technical injury producing flaws.

- a. Start with ten percent of prior workout peak (slow and easy). Do for three practice sessions
- b. If no pain, increase by ten percent each three practice sessions.
- c. If Phase three pain occurs decrease to prior practice level. Make sure proper warm-up, flexibility, aspirin and ice are being used.
- d. If Phase three pain persists for four days check with your medical advisor.

Baseball Pitching Shoulder Practice Schedule:

Baseball pitching does not allow substitute activities. The return pattern of pitching is extremely individualistic. As in swimming, a slow steady ten percent build-up works best (see swimming schedule page 9). A careful review of throwing techniques (see p. 20) to eliminate injury producing flaws is a must.

Hand Sizer

Method of Use:

Place the point of the triangle on the second palm line of the hand. Simply place ruler over the ring finger, keeping fingers and ruler straight at all times. Measure to the tip of the ring finger to find the proper grip size. To measure the left handed player simply turn the Hand'Sizer over.



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